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How Access, Values, and History shape the Sustainability of a Social-Ecological System: The Case of the Kandozi Indigenous Group of Peru

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How Access, Values, and History shape the Sustainability of a Social-Ecological System: The Case of the Kandozi Indigenous Group of Peru

by

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Dedication

To my loving children, Micaela and Marcelo

To my devoted husband, Jorge

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How Access, Values, and History shape the Sustainability of a Social-Ecological System: The Case of the Kandozi Indigenous Group of Peru

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This research examines how the Kandozi indigenous group governs access to fish and timber, how access contributes to their well-being, and if the Kandozi's natural resource use and socio-ecological system are sustainable. The Kandozi occupy a biodiverse tropical forest in the northern Peruvian Amazon with lakes and seasonally flooded areas. This indigenous group has livelihoods that are dependent upon securing access to natural resources that contribute to their well-being; hence it represents a good case study to investigate access and its relation with social-ecological sustainability. Access is defined here as the ability to derive benefits from natural resources. The analysis of sustainability was done by integrating research on both access and well-being. Multiple methods and a comparative examination of access to fish and timber were used to explore historical processes that shape access. The analysis of qualitative data on well-being and quantitative data based on income from fishing activities in 2009, helped evaluate if the Kandozi benefited from the use of resources and clarified the evolution of

their quality of life.

Hypotheses regarding how spatiality shapes access and how sustainability depends upon access to natural resources were tested. Results indicate that factors such as heterogeneity, kinship, land tenure, the legal framework and knowledge all shape access to natural resources. Spatial and temporal heterogeneity in particular is a critical factor because it determines resource availability. Furthermore, this study shows how benefits from the use of resources contribute to the Kandozi's perception of well-being, defined by them as living without worries, which includes meeting economic, social and cultural needs. Results from this study indicate that perceptions of well-being depend on human values and change over time, consequently the sustainability of the social-ecological system fluctuates. This research concludes that sustainability of this and similar systems are dependent upon the moment at which the analysis is done, because of the changing needs of people over time. This study demonstrates that the range of relations and interactions among different processes that shape access, and the historically contingent characteristic of access and its evolution over time, help better understand complex social ecological systems.

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CHAPTER ONE

Introduction

1.1 INTRODUCTION

New approaches in ecosystem stewardship (Chapin et al. 2009a) suggest that it is necessary to understand that communities or regions are systems in which physical, ecological, cultural and social processes interact among each other, and that the resources and ecosystems that provide services to people are influenced by the dynamism of these interactive processes (Berkes 2006; Berkes et al. 2003; Folke et al. 2003). These concerns have long been discussed by geographers, who have been sensitive to the relationship between humans and their environment (Liverman *et al.* 2003; Moran 2004; Ostrom 2009) and have been urging new approaches and collaboration with other disciplines in order to understand complex dynamics of environmental systems interacting with societies (Rhoads 2004).

Dynamic and complex systems of this type are known as "social-ecological systems" (SES) and are the center of interest of a growing literature (Alessa et al. 2009; Janssen et al. 2010; Janssen and Ostrom 2006; Lassoie and Sherman 2010; Lebel et al. 2006; Liu et al. 2007a; Liu and Taylor 2002; Ostrom 2009; Perrings 2007). These new approaches propose the study of the dynamic web of interactions among the different systems (e.g. social and natural), rather than focusing on the characteristics of individual systems or subsystems (Lassoie and Sherman 2010; Peloquin and Berkes 2009). This growth is the result of decades of efforts trying to solve environmental problems piecemeal, without being able to include social systems and to give cogent solutions for answers for current complex problems (Lassoie and Sherman 2010).

Natural protected areas and resource systems, such as fish and timber extraction,

are too complicated to be governed only by the state (Ostrom 2007). For example, in Peru national policies about natural resources often contradict each other, creating conflicts among local people, the state and private extractive companies (Postigo and Montoya 2009). These conflicts complicate the governance of protected areas and natural resource systems. It is not possible to sustainably manage natural resource systems without the participation of multiple stakeholders (Berkes 2009; Ostrom 2007), because of the greater number of stakeholders involved in natural resource management. This increased number causes more entangled systems, due to multiple demands, cultural values, perceptions and behaviors of the stakeholders (Natcher et al. 2005). Consequently, natural resource management (NRM) and conservation need to adopt more flexible and integrative approaches to sustain not only ecological characteristics of the system, but also other social and economic dynamic properties of societies (Chapin *et al.* 2009a).

In the last three decades, Peru has shifted its strategies for biodiversity conservation and natural resource management away from state-centered control towards more participatory approaches, as has happened worldwide (Berkes 2009; Sarkar and Montoya 2010). The recently published national strategy for managing Peruvian protected areas, the "Plan Director de las Areas Naturales Protegidas" (SERNANP 2009) is an example of this shift. Differently from the previous "Plan Director" from 1999, this one plans to actively incorporate local people and institutions in conservation and NRM initiatives, so that they will achieve their own sustainable development. Furthermore, criteria for creating new areas not only are biological or ecological (Rodríguez and Young 2000), but also social, cultural and economic. For example, seven Communal Reserves, five Regional Conservation areas and 20 Private Conservation areas have been created in Peru in the last decade, covering 2,562,939.57 hectares. By law, these areas are

co-managed by the state and indigenous local populations, regional governments and private organizations respectively, with the goal of ensuring sustainable use, promoting biodiversity conservation, and securing people's livelihood. But this is not an easy task because of the multiple claims, and the variety of stakeholders and intricacy of the problems in each particular area (SERNANP 2009).

A SES is an adaptive system that is non-static, in constant change through time (Janssen and Ostrom 2006; Liu *et al.* 2007a). The dynamic structure of the SES is the result of numerous and non-linear interactions between social and ecological processes, and it is influenced by factors such as governmental policies (Liu *et al.* 2007a; Peloquin and Berkes 2009). The interaction of social and biophysical agents takes place at multiple temporal and spatial scales that influence one another (Janssen and Ostrom 2006; Lassoie and Sherman 2010). Consequently, SES characteristics have been limited debated in simple systems. This research acknowledges that the difficulty and uncertainty of natural resource problems derive from the characteristics of the socio-ecological system (Chapin *et al.* 2009b; Liu *et al.* 2007a; Liu and Taylor 2002).

This dissertation is concerned with understanding the intricacy of socio-ecological systems. I examine how an Amazonian indigenous group deals with change in order to have access to natural resources and to benefit from them. For this, I use the case of the Kandozi SES in Peru, focusing on fish and timber. The Kandozi is an indigenous group located in the Abanico del Pastaza alluvial fan in the northern Peruvian Amazon. The Kandozi is a group of approximately 3000 people that still rely on their natural resources for their livelihood.

In order to study a SES, this dissertation analyzes the interactions among biophysical, ecological, socio-cultural, institutional, political and land tenure processes as

they shape access to resources at different scales and levels (Andrew et al. 2007; Cash et al. 2006). By unraveling processes that affect governance access in the Amazon, this study explores the conditions under which the Kandozi indigenous people and presumably other similar groups benefit from the use of resources and attempt to reach and maintain well-being.

I integrate research on access and well-being to analyze the SES, and to better understand the sustainability of this SES. Access is defined here as "the ability to benefit from things" (Ribot and Peluso 2003, p.153). First, I propose access as a framework because its definition includes the ability of a society to benefit from resource use (Ribot and Peluso 2003) which can be related to notions of well-being and the sustainability of a SES (Alessa et al. 2009). Second, this definition of access includes a range of relations and interactions among different processes (Langridge et al. 2006), which helps in addressing the difficulties of evaluating a SES. Third, the historical contingent characteristic of access shows how its study needs to incorporate its evolution over time (Kofinas and Chapin 2009; Sarch 2001). Furthermore, these characteristics provide the framework to evaluate the sustainability of a SES, which is also a dynamic process (Berkes et al. 2003) that involves meeting people's needs over time (Chapin 2009).

By analyzing the Kandozi indigenous group as a case study and with a comparative examination of historically contingent access (Langridge et al. 2006) to natural resources, this dissertation addresses questions related to how two commercially used resources in the Amazon vary in the form of control and access. In particular, this study explains what factors shape access to both timber and fish. Because access to natural resources includes also obtaining benefits from resources (Ribot and Peluso 2003), this study contributes to understanding if the people are benefiting from the use of

natural resources. Perceptions on benefits depend on human values, especially with indigenous people, whose cultural values may differ from more occidental views (Escobar 1996). Consequently, I explore what the Kandozi people perceive as benefits, what quality of life they expect to have and how they could attain well-being. Societies base their well-being on how well needs are satisfied. Nonetheless, these needs change over time due to changes in political and economic contexts (McSweeney 2004; Seixas Simao and Berkes 2003). Therefore, it is also important to perform the analysis of the Kandozi SES with an historical approach to better understand changes over time and future trends in the Kandozi's well-being and the sustainability of the SES.

This dissertation answers three research questions and tests the following hypotheses:

Research Questions:

- What are the factors shaping access to fish and timber by the Kandozi indigenous people?
- Are the Kandozi people benefiting from fish and timber?
- Is the social-ecological system of the Kandozi sustainable?

Hypothesis statement:

- Spatial and temporal heterogeneity shapes access to natural resources, by limiting their availability.
- The sustainability of social-ecological systems depends upon access to natural resources.

This study begins by presenting a literature review of the three main research questions that in turn will support three chapters of results: access, well-being and the analysis of the Kandozi socio-ecological systems through time. Leveraging six years of

professional experience in the study area by the investigator, this study begins with a background section that is divided in two chapters, one corresponding to the physical description of the study area and another that focuses on the Kandozi people. Chapter four corresponds to the methods chapter, which describes how field data was collected and the further analyses that were performed in order to answer the research questions and to test hypotheses formulated in the introduction. Following the methods are three chapters of results that provide a description of the factors shaping access to fish and timber; chapter six about how the Kandozi perceive well-being; and chapter seven draws from chapters five and six to analyze sustainability of the social-ecological system. The last chapter presents a summary of major findings and the conclusions of all three results chapters.

1.2 ACCESS TO NATURAL RESOURCES

Access in this research follows Ribot and Peluso's definition, which combines the ability to derive benefits from the use of natural resources. However, contributions from this research are oriented to understand not only who benefits from natural resource use, but also through which processes. Ribot and Peluso (2003) distinguish access from property, arguing that access is more akin to a "bundle of powers", and property is more like a "bundle of rights". Studies of access draw from a variety of literatures, such as research on property regimes (DeCastro and McGrath 2003; McGrath 2000; Ribot and Peluso 2003; Thomas 1996), from natural resource use rights (Castree 2004; Peluso and Watts 2001), from common property theory (Ostrom et al. 1999), and from political ecology (Bryant 1992; Robbins 2004), among others. It has also been informed by research on livelihoods (Sarch 2001; Scoones 1998).

Studies on access that use a definition based on rights have often neglected other

elements that affect access (Bebbington and Perreault 1999), such as social norms (Ellis 2000), and relationships with the market (Bebbington and Perreault 1999), to mention a few. The focus on rights hinders a comprehensive understanding of how people benefit from resources without having the right to use them. A livelihood approach, on the other hand, emphasizes the role of (formal and informal) institutions, policy context, social relations and external factors (such as vulnerability) for facilitating or hindering access to resources (Allison and Ellis 2001; Scoones 1998). Access is a central theme in livelihood research (King, forthcoming).

However, this research does not use a strict livelihood framework, because I analyze access to natural resources only. Livelihood frameworks on the contrary, study access as the ability of people to accumulate not only natural resources, but also a wider range of resources in order to build livelihoods (Bebbington 1999; Bury 2004; King in press). One of the livelihood frameworks, for example, defines access in relation to the "rules and social norms that determine the differential ability of people" to use a wide array of resources and to benefit from its use (Ellis 2000 p.9). Livelihood is referred to as the way people make their living, including, the means of living and tangible assets they can have access to. And assets are theorized by a livelihood framework as different types of capitals, such as the natural, human, economic and social capitals (Bebbington 1999; Bebbington and Perreault 1999). In addition, livelihood incorporates all the factors and contexts that people need to consider in order to manage their resources in their pursuit of well-being (Ellis 2000; Ellis and Allison 2004; Kofinas and Chapin 2009). Consequently, the study of access from a livelihood perspective (Bury 2004), differs from the framework used in this dissertation that focuses on access to natural resources, to fish and timber in particular.

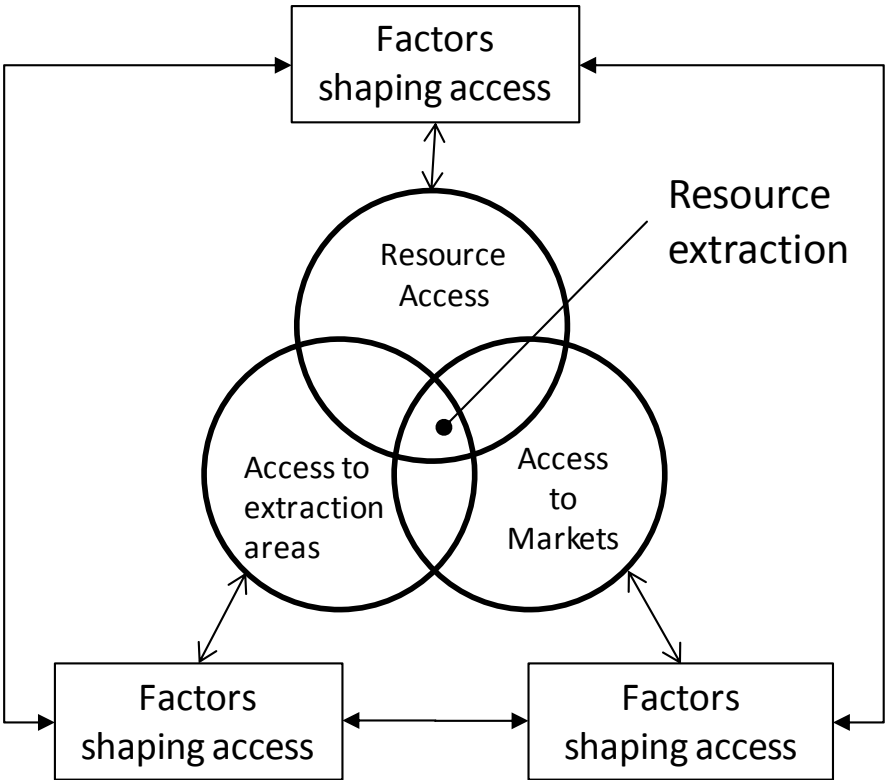
Research on access has also demonstrated how it depends upon the power and social relationships of individual or group users (Baird and Dearden 2003; Ribot and Peluso 2003). Likewise, political-economic and cultural circumstances influence mechanisms to access resources (Castree 2004; Ribot 2000; Schmink and Wood 1992). In addition, access also depends upon economic and ecological features of resources (Greenberg 2006; LeBillon 2005; Thomas 1996), including landscape diversity (Harris 2006; Nebel et al. 2001).

There have been a number of studies in tropical environments that show how landscape dynamics influence access, control, and tenure systems for resource management (Harris 2006; Nebel et al. 2001; Thomas 1996). Tenure rights, for example, vary according to the height of the flooded area and the level of control that people have, depending upon the new configuration of the landscape after flooding (Thomas 1996). The spatial location of a village or community will also determine the availability of a particular resource (Agrawal and Gibson 1999). This is very important to take into consideration, since all the power relations, institutional interactions and state interventions will have to respond to the availability of natural resources. Therefore, access to natural resources is affected by environmental circumstances and not only by social processes (Langridge et al. 2006). In particular spatiality of resources affects access to natural resources.

A conceptual model (Figure 1.1) was prepared in order better understand the way that access can be grouped into three groups: access to natural resources, access to resource extraction areas (this shows the spatiality of access) and access to markets. The latter has been included because this dissertation is focusing on two commercially used resources, fish and timber. So, access to the market is necessary to sell these resources.

The factors that shape access are mediated through these three sets of factors and their interactions. Resource use will be possible if people have access to the resource, and to the extraction area; and if people have access to markets, they will also receive a monetary benefit from it, among other benefits.

Figure 1.1: Conceptual model of access to natural resources



When studying access as dynamic process, it is important to also look at it over historical time periods and in regards to different geographical scales and levels of organization (Langridge et al. 2006; McSweeney 2004). This is the way that access is framed in this dissertation; it is considered an intricate dynamic process and it can be affected by political, economic, social and cultural processes, as well as environmental

spatial and temporal processes. Chapter seven includes an historical analysis of access, while Chapter five describes the factors shaping access in present times.

Factors shaping access to natural resources

Chapter five answers the first research question and presents the factors that were found to shape access to natural resources. This chapter also tests the hypothesis that spatial and temporal heterogeneity is one of the factors that shapes availability and hence, access to natural resources. Most of the access research focuses on rights and power relations, and hence undervalues the role of environmental – spatial and temporal - heterogeneity. In addition, previous studies of access that analyze it over a period of time and in an integrated way are limited (Langridge et al. 2006; McSweeney 2004; Seixas Simao and Berkes 2003).

Consequently, this dissertation studies access to natural resources without using any one particular framework of analysis, such as common property, institutions, or property rights. Access was studied here in all its possible dimensions - economic, political, social, cultural and environmental - in order to avoid biases or the inadvertent exclusion of some factors. Therefore, when questions arise about the factors that affect access, possible factors were analyzed without pre-conceived ideas. As some scholars have argued (Vayda and Walters 1999), open research questions instead of preconceived relations of power could contribute to a better understanding of access. But although no particular framework was used to study access, all of the factors found here are common within the literature on access (Table 1.1).

Table 1.1: Factors hypothesized to shape access to timber and fish

Factors	Natural Resource Access	Focus of previous studies
Spatial/temporal heterogeneity	Determines where and when the resources are available	Physical availability of resources.(Pyhälä 2006; McGrath 1993)
Kinship	Increases or restricts where an individual can go for resource extraction	How social relations shape access rights. (Futemma 2009; Lu 2001)
Land tenure and boundaries	Restricts access only to certain resource extraction areas	Property regimes, territoriality (Seixas and Begossi 1998; Thomas 1996)
Legal frameworks	Regulate quantities, seasons, species and who can use resources	Effect of legal frameworks over access and control. (Mbaiwa 2008; Sarch 2001)
Knowledge	Facilitates access to markets, technology, networks	Role of technology, language, knowledge of the environment ... over access to resources. (Gram 2000; Smith *et.al.*2002;)

Environmental dynamics is one of the factors that will directly determine if a resource is available, not only in space but in time. Especially in the lowlands tropics, flooding patterns are critical in determining availability of fish and timber for the people. Studies in the Amazon (McGrath et al. 2005) and elsewhere (Sarch 2001; Thomas 1996) have shown the importance of the environment for access to natural resources. Studies in Brazil have shown how the diversity and availability of fishing spots will determine the rights that fishers have to fish (Begossi 1998). In Africa, rights of access to fishing grounds change with the level of the flood (Thomas 1996). Common property research has demonstrated how the flexibility of commons institutions responds to ecological

variability (Parlee and Berkes 2006). However, relatively little consideration has been given to ecological variability as a factor that directly affects access to natural resources; it has been considered more as a condition of the natural system, to which people need to adapt.

Rules of access, institutional design, and governance structure vary if the resource is mobile or non-mobile, migratory or non-migratory, if it is a plant or an animal (Adger et al. 2005; Thomas 1996). For example, studies with the Brao people in Cambodia (Baird and Dearden 2003) and elsewhere (Begossi 2001) show that people have to establish a mixture of local rules for access depending upon the type of resource they are extracting. Research in an African community shows that a situation in which a resource becomes more discrete or less fugitive, leads to more exclusive tenure (Thomas 1996). These studies draw from a natural resource management approach.

Property rights, land tenure, kinship, knowledge, legal frameworks, social norms, power relations, among other social elements of societies, have all been considered to be either types of institutions or important social relations by different authors (Agrawal and Gibson 1999; Cash et al. 2006; Cash et al. 2003; Fairhead and Leach 1996; Heltberg 2002; Leach et al. 1999; Lu 2001; McSweeney 2004; Ostrom 1990; Robbins 1998; Young et al. 2008) depending upon the theoretical framework used. There is general agreement that institutions and social relations, which are in fact a set of diffuse relations (Fairhead and Leach 1996), are conditioning the use of natural resources.

For some authors, institutions determine people's access to natural resources (Ellis and Allison 2004). There is typically agreement on the main definition of institutions, which can be summarized as the "rules of the game" (Kofinas 2009; Young 2002). Some other authors divide institutions into formal and informal types (Agrawal

and Gibson 1999; Kofinas 2009). They place laws, constitutions and other governmental regulations under a category of formal institutions. Social norms and local rules on the contrary are categorized as informal (Jütting 2007). This categorization of formal and informal institutions, however, assigns a value to them that may not correspond to reality. Most local indigenous groups consider their institutions more serious and "formal" than the rules that are externally imposed by the state.

Kinship and land tenure have been found (Gow 1991; Pinedo *et al.* 2002; Surralles 2009; Thomas 1996) to be critical factors that shape access to fish and timber. Both can be understood as a social relation, since people are relating to each other through kinship. Also they have a relationship with the land in regards to tenure. There are local rules that operate to determine how access is shaped through kinship relations. For example, in Brazil kinship groups (communities) transform private property of forest lands into a collective appropriation for the users included in the kinship group (Futemma 2009). Thus, it is important to understand how these factors operate within the society and how they are regulated to influence access.

Knowledge is also a factor that has an effect on access to natural resources, because it is interrelated with particular cultural, social and ecological contexts (Parlee and Berkes 2006). Knowledge has been defined as the construction of the perceived reality of a group, and members of that group use that reality to guide behavior among them and towards the world around them (Millennium Ecosystem Assessment 2003; Reid 2006). The role of knowledge has been largely studied in different literatures. For example, some studies have focused on the role of knowledge and the relations of power that can be produced between local communities and development agencies or the government (Sletto 2008). Others have studied how to integrate scientific knowledge

with local knowledge (Cash *et al.* 2003), or how traditional knowledge can sustain relationships with nature (Walker *et al.* 2010).

Knowledge can be generated in different ways and using a variety of sources (Parlee and Berkes 2006; Sears *et al.* 2007). Knowledge building in academia often involves hypothesis testing, while in other societies, like indigenous groups it is part of a more intuitive or even more spiritual process, in which people combine empirical observation and individual and collective interpretation (Parlee and Berkes 2006). Knowledge can be transmitted in various ways. For example, traditional knowledge is considered as cumulative body of knowledge practices and beliefs, passed from generation to generation through oral history and experimentation among others mechanisms (Berkes 2009; Reid 2006). Sources of building knowledge can be inside or outside the community. People can collect knowledge through learning different skills (e.g. language, technical and managerial skills). They can also learn to value and recognize particular characteristics of resource management, and the different levels of organizations can also help people with the generation of more knowledge (Berkes 2009). Consequently, there are different approaches to study knowledge.

Knowledge in this research includes traditional knowledge, understood as an ongoing learning process that continues to develop through observation of the environment and influenced by constant feedbacks from different people (Parlee and Berkes 2006). In addition, traditional knowledge is considered important in sustaining relationships between local populations with their environment (Walker *et al.* 2010); and includes acquired skills such as a new language, fishing and timber technical skills (Sears *et al.* 2007) and using different scales of organizations to bring together science and local knowledge. Knowledge also helps processes of self organization (Berkes 2009).

One of the reasons why indigenous people claim to have the right to control access their territories and natural resources is because they frequently assert having knowledge and traditions that permit sustainable management of natural resources (Gram 2000). They not only have the knowledge but also the instruments and social relations needed to meet their basic needs and conserve resources. For instance, indigenous people have acquired the knowledge and ability to fish for subsistence. They know what, where and when to fish, according to their needs and according to spatial and temporal heterogeneity of the ecosystem (Pinedo *et al.* 2002; Seixas and Begossi 1998; Seixas Simao and Berkes 2003; Smith *et al.* 2002). The same applies to other forest products. Based on their needs, indigenous people will use their knowledge, and technology to cut a tree or to increase fishing intensity as needed (Pinedo *et al.* 2002; Smith *et al.* 2002).

People benefit from governing access to natural resources, and those benefits are in relation to their needs. However, as in the case of access that evolves through social relations and changes over time (Langridge et al. 2006; Sarch 2001), needs are also continually changing. As a result, well-being related to meeting people's needs will be constructed through different mechanisms of access to natural resources that are under permanent change (Kofinas and Chapin 2009). Consequently it is also important to understand how the Kandozi conceive of their well-being and how it has been attain at different points in time in the past.

1.3 WELL-BEING AND SOCIAL RELATIONS

"Well-being" has been defined as the experience of a good quality of life (Chambers 1995). Note that quality of life goes beyond material things. It is related to more subjective aspects of meeting needs such as having a healthy environment and good social relationships (Helliwell and Putnam 2004). Below is a literature review on well-

being and quality of life that includes a new way of conceptualizing quality of life as proposed by national and international indigenous organizations, such as the CAOI (Coordinadora Andina de Organizaciones Indígenas) in Latin America.

Well-being and quality of life

Today, the social and economic sciences face the challenge of defining well-being and quality of life of societies. Due to the ambiguity and relativity of both concepts, it is even more difficult to find appropriate methods for their measurement (Kahneman and Krueger 2006). Quality of life has been studied from an economic approach, however this has limitations. It only considers the economic capacity of people for obtaining market benefits and services (Diener and Suh 1997). Another limitation is in regards economic progress, which will not guarantee other important concerns such as environmental quality. Furthermore, economic progress can be seen as inversely correlated with quality of life, because people may choose those goods and services that not only are inconsistent with their values, but that will not necessarily make them happy (Diener et al. 2003; Diener and Suh 1997; Kahneman and Krueger 2006).

New approaches to defining quality of life in the last decades have varied in regards to philosophical frameworks (Diener et al. 2003; García Hierro et al. 2008). Diener and Suh (1997) claim that there are three main philosophical frameworks used when defining quality of life: a) one based on normative ideals, b) the second based on the satisfaction of preferences, and c) the third based on the definition of quality of life on individuals' experiences. These authors suggest the integration of these different frameworks and propose that measurements of well-being should integrate objective (including social indicators) and subjective (e.g. satisfaction with life) characteristics of well-being. Others authors (Acosta and Martínez 2009; García Hierro et al. 2008) use the

notion of living well ("buen vivir" in Spanish) and this is what is gaining more relevance currently in the indigenous movement internationally (Carpio Benalcázar 2009; Huanacuni Mamani 2010).

The framework based on normative ideals of society includes but is not limited to religious, behavioral and philosophical systems. This framework defines quality of life without considering the subjective experience of people, or the fulfillment of people's desires. It has to do with what a person wants to do in relation to normative systems. This definition of quality of life is akin to social science's indicators, such as health, education and income (Helliwell and Putnam 2004; Renshaw and Wray 2004; Vallejo 2009).

The second framework relates quality of life to satisfaction of people's preferences. The argument here is that a person selects the resource that contributes the most to the improvement of his/her quality of life. This selection is done within the person's limited resources, and abilities. People will select their way of living according to their own individual wishes. This view of quality of life can be compatible with a more economic one, especially if the person's primary goal is to meet material needs (Diener and Suh 1997).

Quality of life can also be defined in terms of individual experience. If one person experiences that his/her life is good and desirable, then what he/she has is what he/she needs. Under this definition several factors are essential and these factors are not necessarily material. These factors include happiness, satisfaction and others associated with the subjectivity of well-being (Diener and Suh 1997). For this approach it is necessary to explore how this person feels about his/her life and how he/she experiences well-being under his/her own standards, which can vary from person to person, from culture to culture, or from nation to nation (Diener et al. 2003; Kahneman and Krueger

2006). Quality of life, then, is related to satisfied needs of a person or of a group of people (family, society, nation, etc.). The more needs that are fulfilled the more improved the quality of life is. However, the question about what is considered a need, deserves further discussion (Renshaw and Wray 2004).

El buen vivir: Living well

The CAOI is an international organization that includes 14 indigenous organizations from six Latin American countries. The CAOI is proposing another way of thinking about quality of life and well-being. This approach is called "El Buen Vivir" (Acosta and Martínez 2009) which is translated here as "living well". This conceptualization has been collectively constructed by indigenous people from CAOI and other organizations, and it has become their central paradigm. It has been constructed based on indigenous views of development and indigenous ways of relating with nature. This concept looks for harmonious relationships among human beings, and between them and nature. This implies that needs not only are food, water, energy, housing, education; they also are respect, self-esteem, good social relationships, rest, freedom, the control of fate and others (Carpio Benalcázar 2009; García Hierro et al. 2008; Huanacuni Mamani 2010; Kofinas and Chapin 2009; Quintero 2009). The elements of living well are related to the subjective well-being, and to the second approach proposed by Diener and Suh (1997).

"Living well" is a complex construction with multiple facets that requires diverse approaches and conceptual frameworks in order to be understood. There is not a single definition of living well because it will depend on each person's values or the values of a society. The notion of living well is incorporated in each culture's cosmovision. Under an indigenous cosmovision framework, "nature is conceived as a living being in which all

parts are interrelated, man being one of them" (Haverkort and Millar 1992, p.1). In fact, different cultures have different ways of defining living well and they may have a word or phrase in their own language for defining it. For the Aymaras from Bolivia for example, living well is translated as "suma qamaña", which means living in harmony and in balance with the Earth's living cycles and all forms of existence. In the Guarani language living well is translated as "Teko Kave", which implies having respect for life. Another example comes from Colombia. Indigenous groups from the Colombian Amazon region referred to living well as "volver a la maloka" (where "volver" means return and maloka is a thatched-roof house). With this phrase they acknowledge the value of ancestral knowledge and a harmonious relation with the environment (Huanacuni Mamani 2010).

Indigenous populations from the Andes and elsewhere have been proposing in recent years new conceptual and methodological challenges to redefine conventional paradigms about quality of life, well-being and poverty measures (Acosta and Martínez 2009; Renshaw and Wray 2004). These new approaches have to consider ethnic and cultural diversity, and have to be done based on a rights perspective (Kahneman and Krueger 2006; Vallejo 2009). Most indigenous populations are still in intimate relation with the land. This relationship is based on social harmony, mutual respect and reciprocity among its members. Natural resources are the base of their livelihoods. Consequently access to land and to natural resources is a basic condition in order to achieve well-being. Resources in addition, are part of their identity (García Hierro et al. 2008; Renshaw and Wray 2004). Other aspects considered by indigenous populations as priorities to meet their well-being are control over land, conservation of natural resources, maintenance of identity and culture, spirituality, autonomy, justice, social organization,

and food security, among others (Vallejo 2009).

How indigenous populations face changes and how they are able to influence decision-making processes that affect them is a key element for well-being of indigenous populations (Renshaw and Wray 2004). This will have an impact on future generations' well-being, which is of great relevance for indigenous philosophies and their continued existence as societies. But in order to secure a quality of life for future generations, indigenous populations also have to sustain the capacity of ecosystems to meet their livelihood needs. So, both well-being and livelihoods are key elements that will determine the sustainability, resilience and adaptability of people to changes (Kofinas and Chapin 2009).

The goal of Chapter six then, is to show how the Kandozi people perceive their well-being and how these perceptions have been changing over time and with different generations. This was done to complement the analysis of access' benefits from natural resource use in Chapter five. Data comes from informal conversations with the Kandozi people and from the answers to semi-structured and open interviews. This chapter also provides insights concerning the Kandozi's needs and briefly explores how the Kandozi deal with monetary income. The latter was done using data from an opportunistic sampling of income and expenses of a group of 77 fishermen of different ages. These help to illuminate some tendencies on income by age and categories of expenses of all the income received during the fishing season in January 2009. Chapter six does not intend to be a study on the economy of the Kandozi. Such studies (Bergman 1990) require a different set of data. However, results from the well-being chapter, together with results from Chapter five, show the dynamism of the SES and demonstrate that well-being evolves over time. So, results from Chapters five and six serve as inputs for the analysis

of the Kandozi socio-ecological system and its sustainability.

1.4 The Relevance of Access to Socio-Ecological Systems' Resilience and Sustainability

In order to elaborate on the relationship between access, resilience and sustainability Chapter seven analyses the sustainability of the Kandozi socio-ecological system (SES) in relation to the evolution of access to fish and timber by the Kandozi people. It draws from the factors that shape access to fish and timber by the Kandozi people (Chapter five), from the benefits and well-being obtained by the Kandozi from using those resources (Chapter six) and draws also from the background information described in Chapters two and three. By using the Kandozi SES as a case study and their notion of well-being, Chapter seven tests the second hypothesis by exploring and unraveling how access to natural resources can be used as a framework to study the sustainability of an SES and to integrate natural resource management with well-being. The conclusions chapter (Chapter eight) in addition answers the third research question about the sustainability of the Kandozi SES.

The Social-Ecological System (SES)

A SES, also called by others a human-environment system (Clark 2002) or coupled human and natural system (Liu *et al.* 2007b) is a system of multiple different subsystems (e.g. governance systems, resource system such as forestry and fisheries) and variables (e.g. location, history, knowledge of SES) (Ostrom 2009) influenced by several internal and external processes (physical, ecological, economic and cultural). These processes and variables are in permanent change, hence their past history as well as future events determine how the SES responds to perturbations in order to persist and meet needs.

A SES is also comprised of feedbacks among human values and perceptions (Kandozi cultural values, for example), and the biophysical dynamism of the ecosystems (Alessa *et al.* 2009; Chapin *et al.* 2009a; Clark 2002; Ostrom 2007). However, all these processes, variables and interactions that undergo changes, and which operate at differential spatial and temporal scales (Berkes 2002; Berkes 2006; Folke 2006; Folke et al. 2002; Janssen and Ostrom 2006) are difficult to predict, and provide great difficulty to an SES and its management (Chapin *et al.* 2009a; Ostrom 2007; Walker *et al.* 2002). Consequently, it has been proposed that a SES can be understood by elucidating its social and ecological components, and by understanding their interactions over time (Gunderson 2003; Ostrom 2009).

Social-ecological systems have been studied by using institutions and economic perspectives (Anderies *et al.* 2004; Janssen and Anderies 2007; Janssen *et al.* 2010; Ostrom 2007), commons research (Berkes 2006), or frameworks such as sustainability science (Anderies et al. 2007), or co-management of natural resources (Armitage et al. 2009), among others. These literatures used to study SES also have been used to study access, because access to natural resources is considered a "complex and dynamic process dependent on specific risks and timescales" (Langridge *et al.* 2006, p.3). In addition, access to natural resources has also conceived as been influenced by social and environmental processes and their relations (Langridge *et al.* 2006).

A recent study (Alessa et al. 2009), claims the need of understanding SES as complex "messy" systems, with multiple resources, and multiple users that change constantly in order to maintain a balance with well-being. This connection to well-being, in relation to the different mechanisms people use to access resources to meeting their needs, are key to understand how SES needs to transform in relation to sustainability

(Kofinas and Chapin 2009).

Resilience and Sustainability

Sustainable use is a dynamic process (as is access) by which societies adapt to change (Berkes et al. 2003) in order to meet their needs, maintaining or increasing the productive base over time. Sustainability requires that this process of meeting present needs does not compromise a future generation's ability to meet their own needs (Chapin 2009). A sustainable SES involves the system being able to maintaining its functionality after a perturbation, or being able to renew or reorganize itself after its structure and function have been disturbed (Seixas Simao and Berkes 2003). The system will increase its adaptive capacity to recover from perturbation if, among other things, people maintain access to resources and benefit from their use (Chapin *et al.* 2009a).

The SES's ability to respond to perturbations is called resilience (Walker et al. 2002). Resilience has been considered by some authors (Folke et al. 2003) a key property of sustainability and has been proposed as one of the approaches to study sustainability (Chapin 2009). SES resiliency is partly determined by people's livelihood security (Berkes *et al.* 2003), which in turn involves questions of access to resources (Sen 1999).

Recent studies suggest that resilience is related to the ability of people or societies to maintain access to natural resources (Alessa *et al.* 2009; Chapin *et al.* 2009a; Langridge *et al.* 2006; Seixas Simao and Berkes 2003). Allesa and her colleagues (2009) characterize SES in relation to resilience capacity, linking this capacity to the ability to gain, maintain and distribute access to natural resources over time. This is done maintaining a "dynamic and flexible" balance between both social and ecological well-being (Alessa *et al.* 2009).

Seixas and Berkes (2003) have identified in a fisheries study different factors that

build or weaken social-ecological resilience in resource management. Some of the factors identified in this study, such as robust local institutions, local ecological knowledge, institutional instability, and equity in resource access are similar to the factors that shape access to natural resources found in the Kandozi territory. Another study analyzes the construction of social resilience of a SES (Langridge *et al.* 2006) investigating the mechanisms that four different communities have to access water during water shortage periods. Mechanisms of access identified by Landgridge are related to the factors that shape access to natural resources found in the Kandozi territory, such as the physical form of the resources, and the technology used to access the resource.

The distribution of resource use benefits (Langridge *et al.* 2006) and equitable access to natural resources (Seixas Simao and Berkes 2003) are two important elements of a SES' resilience. The more equitable access the people have, presumably the more resilient the system is (Seixas Simao and Berkes 2003). This is because in a situation of inequity to access conflicts among the users will increase and the system can break down. Other studies have suggested that a positive relationship exists between resilience and resource or land entitlements of individuals or societies (Berkes et al. 2003; Langridge et al. 2006).

Resilience depends on various factors, such as the adaptive capacity of the system (Folke *et al.* 2003), environmental and social history, ecological knowledge, livelihood security (Berkes et al. 2003; Tengö and Hammer 2003), and legitimacy and social trust (O'Riordan 2004), among others. All these themes are discussed in this dissertation as influencing access to fish and timber by the Kandozi people. Questions about the mutually constitutive characteristics and interactions of access and resilience are still unresolved (Langridge et al. 2006).

I argue that one of the differences of the access (as used here) and resilience approaches to investigate sustainability is how they conceptualize environmental dynamics. Environmental change (e.g. yearly floods, droughts, resource scarcity, and diversity) in this study is considered an important factor that shapes access to natural resources. A resource will be available for people if it is physically available, and that will be determined by the environmental dynamics. Nonetheless, in a resilience study, these changes are viewed as the perturbations that a SES needs to adapt and respond to.

A SES will be sustainable if it is resilient to changes and if the people can reach long-term well–being (Chapin *et al.* 2009a). Nevertheless few studies on sustainability of SES incorporate variations on well-being perceptions, new desires and needs (Lassoie and Sherman 2010). Consequently, this dissertation considers well-being variations over time and shows how the sustainability of a SES is relative. Therefore, the sustainability of the Kandozi SES is also relative, and it will depend upon when it is analyzed. This study also shows how with an access perspective, sustainability can be investigated especially when the SES has a high level of dependence on natural resources for its livelihood (Futemma 2009).

CHAPTER TWO

The Kandozi Territory Study Area

The study area corresponds to the Kandozi indigenous territory located in northern Peru. This area has not been formally recognized by the Peruvian state, but it was delimited by a participatory indigenous process between 1995 and 1997. During this process nine different indigenous groups, which are part of the Regional Indigenous People Organization (CORPI), agreed on their internal boundaries by establishing interethnic agreements (Chirif and Hierro 2007; CORPI 2002). This was done with the political, financial and technical support of the National Indigenous Organization AIDESEP. As a consequence of the delimitation, the Kandozi territory is considered a legitimate area for the indigenous people, and its boundaries are respected by other groups.

2.1. LIMITS AND GENERAL CHARACTERISTICS OF THE STUDY AREA

The Kandozi indigenous territory is located in the lower portion of the Pastaza River basin. It encompasses 9,116 km² of tropical forest, with seasonally flooded areas and lakes (Illustration 1). Administratively, the study area is in the department of Loreto and it is found in two provinces: Alto Amazonas and Datem del Marañon. Most of the Kandozi people live along the Nucuray River in Alto Amazonas. The remainder of the Kandozi communities are located in Datem del Marañon. The territory is surrounded by other indigenous territories. The Achuar and Kiwcha people are located to the North, the Urarina to the East, the Kukamilla and mestizo riverine communities from the Marañon River to the Southeast, and with the Shapra to the West.

Illustration 1: Seasonally flooded areas and lakes in the Chuinda River

The Pastaza is the principal river within the Kandozi territory. In addition, two main tributaries of the Pastaza River (Huitoyacu and Ungurahui), three main affluents of Lake Rimachi (Chapuli, Chuinda and Pirumba), other small rivers and Lake Rimachi itself are contained within this territory (Figure 2.1). Those rivers are the main waterways (Illustration 2) for transportation and communication within the area. The Pastaza River originates in the highlands of Ecuador and according to expeditions of the second half of the 20th century. It has a total length of 650 km, of which 450 km correspond approximately to its Peruvian section (Faura Gaig 1962; Santillana 2004; Stiglich 1922). Including both countries, the Pastaza River basin covers an area of approximately 40,000 km² and spans an altitudinal gradient of nearly 6,000 meters (Anderson et al. 2009) (Figure 2.2).

Figure 2.1: Location of the Kandozi territory

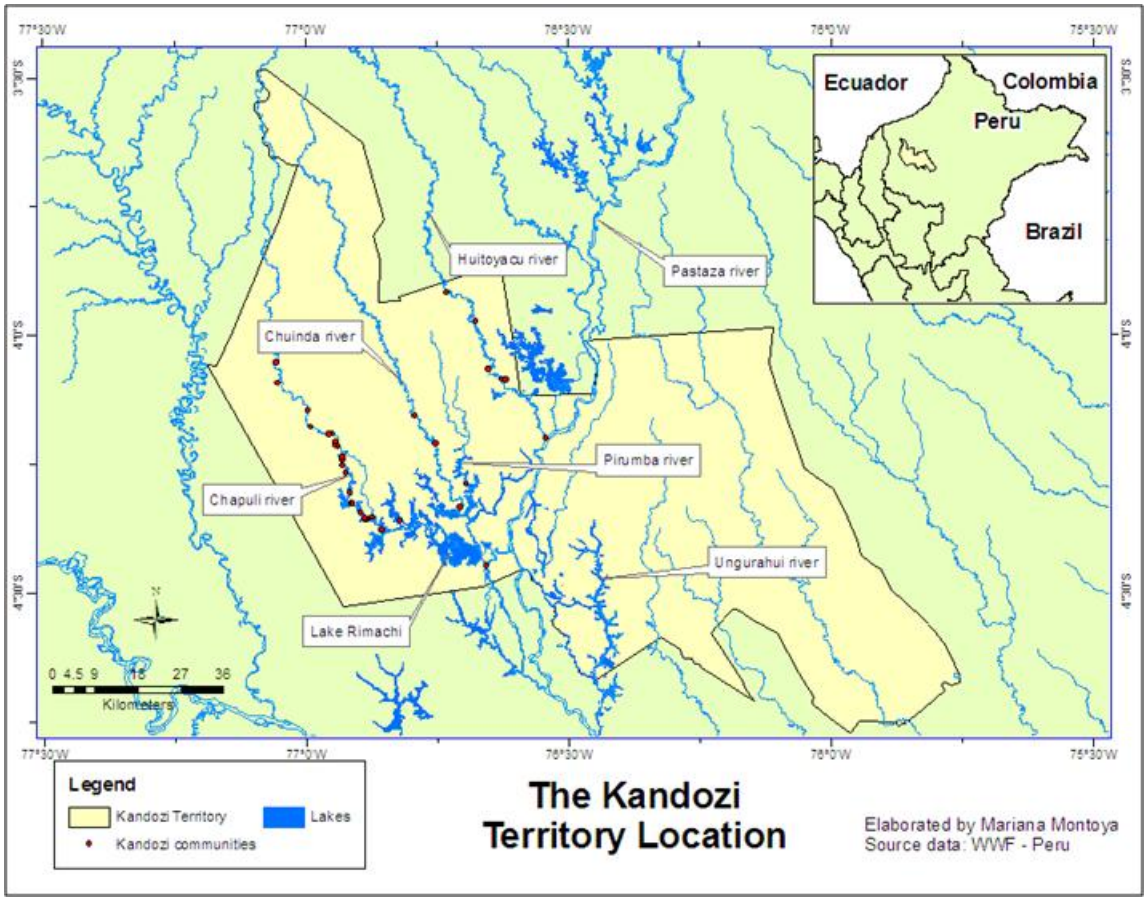
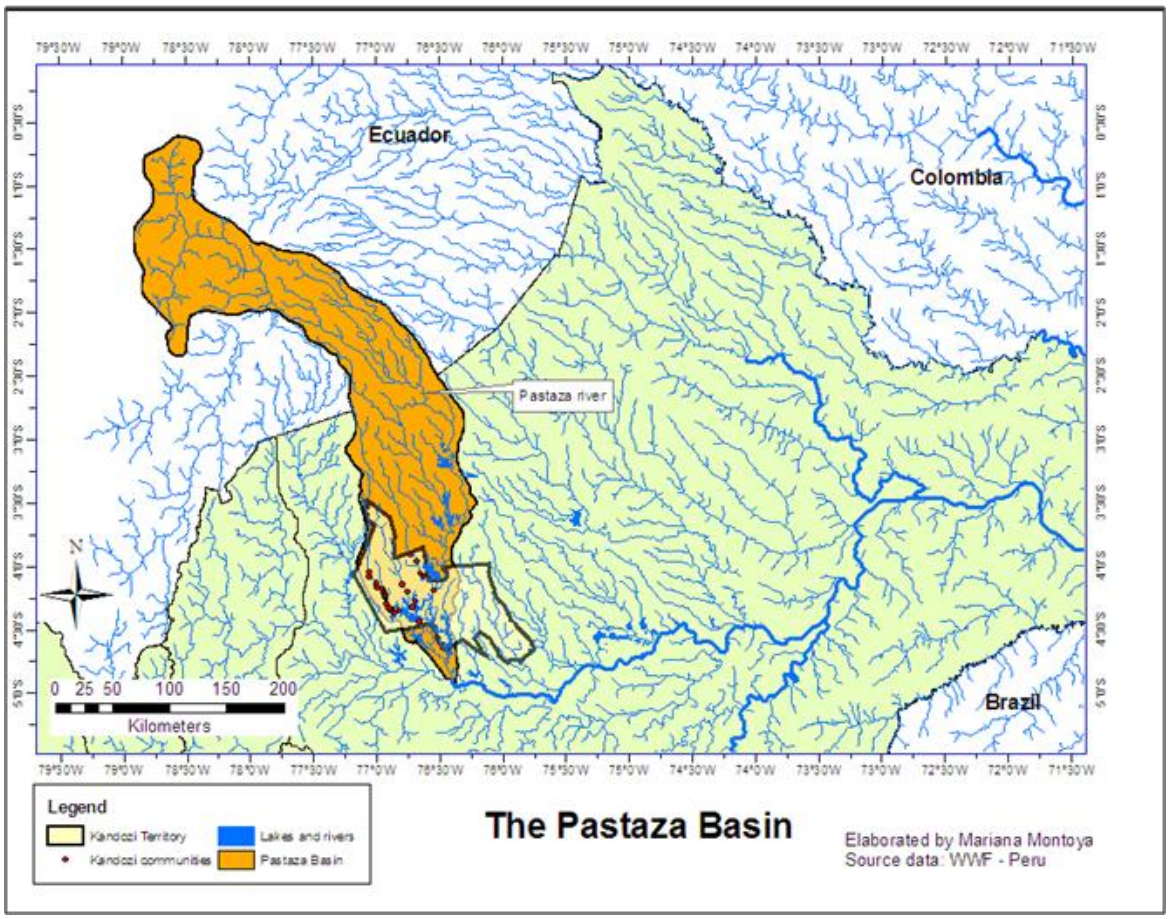


Illustration 2: Rivers are main waterways in the area

Figure 2.2: The Pastaza Basin



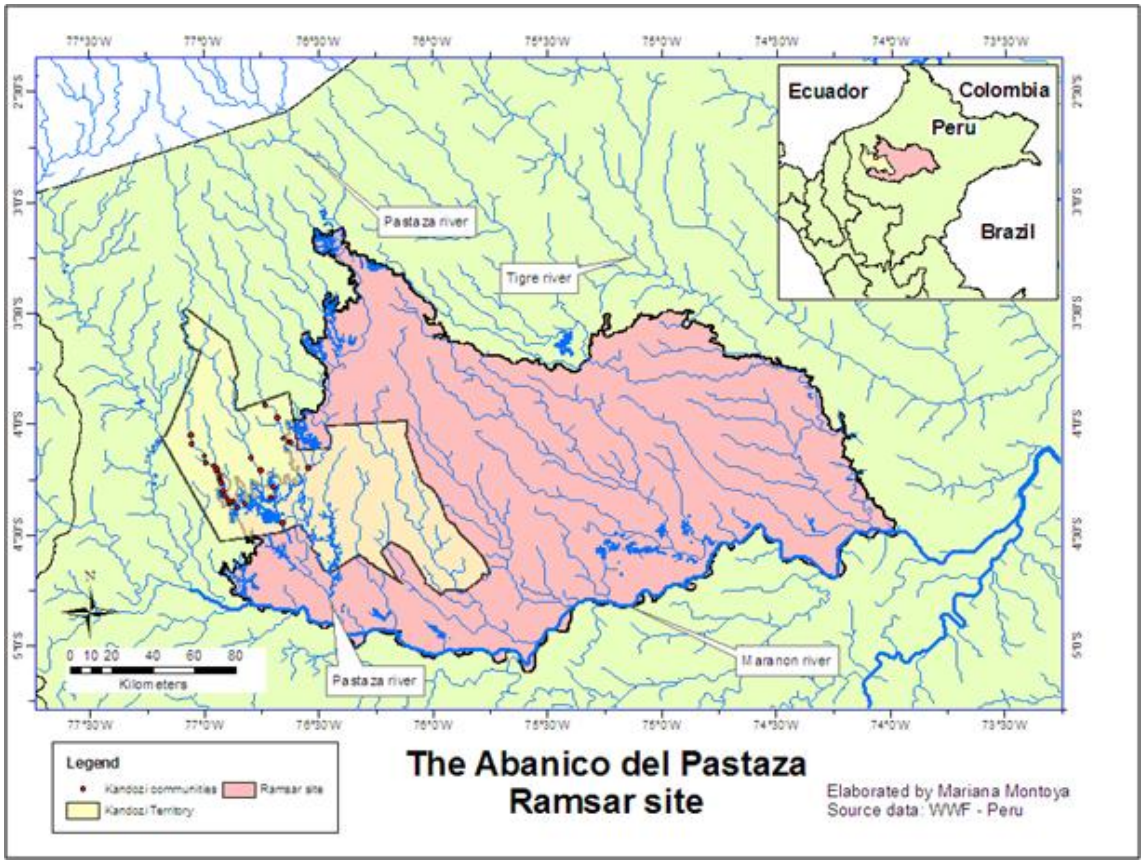
The Pastaza River is an important tributary of the Marañon River that drains into the Amazon together with the Ucayali River. Other main tributaries of the left bank of the Marañon River are the Santiago, Morona, and Tigre Rivers (Sioli 1984). At a larger extent then, the Pastaza basin is a sub-catchment of the Amazon River basin, and it is also included within a geological depression, the Pastaza fan. In Peru, the Pastaza fan ("Abanico del Pastaza" in Spanish) has its boundaries loosely formed by the Marañon River in the south and the Tigre River to the east (Figure 2.3).

A Peruvian portion (38,000 sq. km) of this geological depression - which floods for several months of the year - has been recognized by the Ramsar Convention as a wetland with international importance, primarily for the diverse wetland types that it harbors (Ramsar 2006). It is named the "Abanico del Pastaza Wetlands Complex" Ramsar site (Figure 2.3). It makes an outstanding contribution to world biodiversity, and also hosts important populations of migratory fish, such as "boquichico" (*Prochilodus nigricans*), which is one of the most important species used by local people in the Amazon basin (Anderson et al. 2009). The Kandozi territory partially overlaps with the Pastaza fan, so its characteristics are relevant for the Kandozi people. The following section describes what is known concerning the origins of the Abanico del Pastaza and its connection to ecosystem diversity.

2.2. THE ABANICO DEL PASTAZA

The Abanico del Pastaza is the largest humid tropical alluvial megafan in the world. It encompasses 60,000 sq. km (of which approximately 54,000 sq. km are in Peruvian territory) and it is situated on the eastern catchment of the Amazon River basin, draining from the Ecuadorian Andes to the Peruvian northwestern Amazon (Räsänen et al. 1992). More specifically, the apex of the Pastaza megafan is located between the Ecuadorian Subandean domes of Cutucú and Napo mountain chains, at the Pastaza River's outlet (Bes de Berc et al. 2005). This corresponds to the Pastaza-Marañon retroarc intraforeland basin in Western Amazonia, and is one of the four basins in this region formed when the Andes were evolving earlier in the Cenozoic era. The history of the past 10 million years and characteristics of remote areas in the Andes continue to influence the ecology of the Amazon River (Latrubesse *et al.* 2010; McClain and Naiman 2008; Roddaz *et al.* 2005). The Abanico del Pastaza is no exception.

Figure 2.3: The Abanico del Pastaza Wetland Complex Ramsar site



This area combines Andean rivers carrying changing pulses of volcanoclastic sediment loads with Amazonian black water rivers and ria lakes. Together they create a patchy matrix that favors the development of diverse ecosystems and habitats. The Abanico del Pastaza is a good example of how processes occurring for millions of years have formed the fan and they continue shaping it. This area also gives the opportunity to understand how processes (lifting) occurring not only within the Pastaza basin, but in a larger extent in the Andean region, have also influenced local spatial heterogeneity. This heterogeneity includes both terrestrial and aquatic ecosystems - different types of forests patches and a variety of wetlands that have different types of waters (Illustration 3)

(Kalliola et al. 1992; Kvist and Nebel 2001; Puhakka et al. 1992; Räsänen et al. 1992) - that are key for local people's livelihoods.

Illustration 3: Wetlands in the Abanico del Pastaza area

The present topography started to develop during the Miocene-Pliocene and continued until the late Pleistocene (Bes de Berc et al. 2002; Bes de Berc et al. 2005; Dumont 1996; Räsänen et al. 1992). Deposits from early epochs until the Pleistocene correspond to the Mera formation, which is a broad terrace formed by a “thick unit of andesitic breccias with chaotic internal structure typical of [lahars]” (Bes de Berc et al., 2002 p.86). This Mera formation or plateau was the proximal part of the Pastaza megafan; thereafter it has been incised by the Pastaza River, which deposited its sediments while running in an eastward direction. However no or little overbank

sedimentation has been observed.

Based on 14C age measurements, Bes de Berc and others (2002) claim that fluvial sediments from the Mera formation are located above the current Pastaza River, indicating an incision rate of at least 0.44 cm/year. This incision rate is much higher (4.74 to 7.14 cm/year) in the Upper Pastaza valley, where large lahars formed a series of aggradations terraces that have been deeply incised by the Pastaza River. These and other high incision rates could have been the result of local tectonic movements in addition to overall orogenic uplift (Bes de Berc et al. 2002; Bes de Berc et al. 2005; Räsänen et al. 1992; Räsänen et al. 1990). The origins of the Abanico del Pastaza have been attributed to the size of the catchments in the Andes and the type and amount of volcanic debris. As the Pastaza valley cuts across thrust and folds, such as the Subandean fault, the role of tectonics is also critical for the fan formation (Bes de Berc et al. 2002; Bes de Berc et al. 2005; Räsänen et al. 1992; Räsänen et al. 1990).

Although Ecuadorian volcanoes have had a complex history during the Pleistocene, the Cotopaxi, Sangay and Tungurahua volcanoes have remained active throughout the Holocene and continue to erupt today. Indeed there is evidence that lahars from the Cotopaxi volcano reached the apex of the fan forming Holocene terraces (Räsänen et al. 1992; Räsänen et al. 1990). However, there is also evidence from the distal part of the fan in the Corrientes River that suggests that older deposits underlie volcanic debris flow deposits on the apex of the fan, near Mera (Räsänen et al. 1992; Räsänen et al. 1990). This may indicate that the Mera surface could be a “major discontinuity in the history of the Pastaza fan and separates a Pliocene-Pleistocene stage dominated by deposition from a Holocene stage where incision is largely predominant” (Bes de Berc et al., 2005 p.359).

2.3. THE PASTAZA RIVER

The Pastaza River is the largest river in the fan and is the megafan's feeder channel. It drains the slopes of the following composite volcanoes: Sangay, Cotopaxi, Altar, Carihuairazo, Chimborazo and Tungurahua. It is formed by the junction of the Baños and Palera Rivers, in the easterly region of the Ecuadorian Andes. It can be divided into two parts or sections: Upper Pastaza (from the origins to the mouth of the Huasaga River) and Lower Pastaza (from the mouth of the Huasaga River to the mouth of the Marañon). The principal tributaries of the Pastaza River are the Huasaga and Huitoyacu Rivers on its right bank and the Capahuari and Bobanaza Rivers on its left bank; the confluence of the latter determines the international border between Ecuador and Peru (Faura Gaig 1962; Saunders et al. 2007).

Several of these volcanoes in Ecuador are currently or recently active. Therefore the Pastaza River continuously transports massive amounts of volcanoclastic debris in the fan (Bes de Berc et al. 2005; Räsänen et al. 1992), which change frequently the course of the river. Like other tropical rivers (Latrubesse et al. 2005), the Pastaza has had different courses across the fan, creating different patches of sediments over time. In the Holocene, this river relocated its channel to the south-southwest across the fan surface, disrupting the southeast drainage of the fan (Räsänen et al. 1992). This and other relocations that the river has gone through create a complex system. It comprises abandoned floodplains and sediments with different ages and a patchy configuration, which had and still have a direct effect in the distribution of diverse vegetation types in the area (Puhakka et al. 1992).

By looking at studies of avulsion processes of the Pastaza River and other rivers in the Amazonian foreland, such as the Puyo River, it can be argued that the drainage

system has been modified by folding and faulting forces. Due to this, topographic differences of the drainage system between the proximal and the distal part of the fan can be found (Bes de Berc et al. 2005; Räsänen et al. 1992). The former is more immature and probably is still uplifting, but the latter is older and it is probably sinking (Bes de Berc et al. 2005). These differences in drainage system ages, in addition to river relocations, create floodplains not only distinct in age but in chemical and physical properties. This in turn will influence ecological succession processes (McClain and Naiman 2008; Puhakka et al. 1992).

As with many other tropical rivers in South America and also in India, the Pastaza River has an alternating single and multi channel morphology (Latrubesse et al. 2005; Räsänen et al. 1992). Along the first 200 km starting downstream from the fan's origin (apex, near the Mera formation) the Pastaza River is braided. This is due to the large amounts of a blackish, sandy-type volcanoclastic bedload that the Pastaza River transports into the lowlands. Further downstream, the channel varies in width and depth, a favorable condition for building up levees on the floodplain. Farther downstream across the floodplain, the river will adopt different characteristics, ending however in the floodplain with anastomosed channels, islands of variable size, and overbank deposits (Bes de Berc et al. 2002; Räsänen et al. 1992).

The multi-channel characteristic of the Pastaza River makes it very difficult for navigation, as first reported by missionaries and military expeditions to the area (Anónimo 1943; Monnier 2005; Rivera Martinez 2007; Santillana 2004). Because of its size, overwhelming flow, hydrological dynamics and its changing deposits of sand-sized particles, the Pastaza River has caused many deaths and accidents among explorers and missionaries and this impeded colonization. However, it was considered a very important

river during the 17th century, since it was the main route of connection between settlements from Peru and Ecuador (Anónimo 1943; Rivera Martinez 2007). The Pastaza was first mapped in 1707 by Samuel Fritz, an important contribution for early missionaries and future expeditions (Santillana 2004).

2.4. THE FLOODPLAIN AND LAKE RIMACHI

The Floodplain

Aggradation in the Pastaza-Marañon has resulted in flooding and frequent avulsion processes, all of which have created the floodplain in the southern portion of the Pastaza fan (Räsänen et al. 1990). Furthermore, there is also evidence of the continuous migration of rivers in this region. The Marañon River for example has migrated to the north. The Pastaza River on the contrary has gone to the southwest. The distance they have migrated over time is unknown (Dumont 1996; Räsänen et al. 1992; Smith et al. 2002). This is important because migration of these rivers has an effect on the current characteristics of the area.

The Pastaza River is migrating because of the uplift of the Iquitos Arc on the east and because of the Lorocachi structure to the northeast (Bes de Berc et al. 2002). A geo-chemical study of the Pastaza's waters (Briceño 2005) found that this migration has caused the recent development of a channel that connects the Huangana River with the Pastaza River. This has resulted in a considerable contribution of water and sediments to the floodplain between both basins, the Pastaza and Huangana, leading to the development of a large wetland and a delta within it. Furthermore, downstream of the new channel, a body of mixed waters has formed along the Huangana River creating a shallow and scattered (diffuse) river channel in the floodplain (Briceño 2005) (Figure

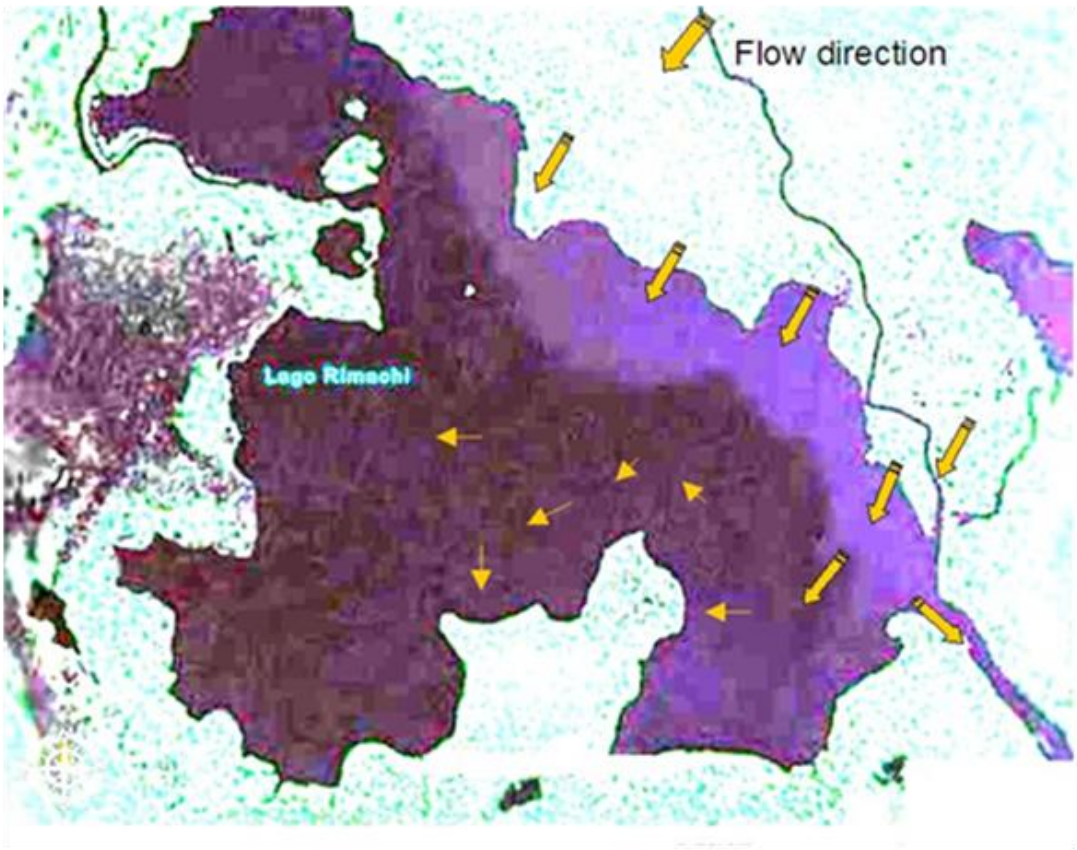
2.4).

Figure 2.4: The Huangana river channel.

Source: Briceño 2005.
(Area inundada: flooded area; canal difuso: diffuse channel; ramal: channel; cocha:lake)

Mixed waters drain through the wetland (not through a channel) to the southern section of Pirumba cocha, and then through a channel, ending in Lake Huangana (Huanganacocha). Further downstream, these waters mix with Chuinda River's black waters and then this river ends in Lake Rimachi, which in turn is affected by these mixed waters in its northern and northeast sections (Figure 2.5) (Briceño 2005).

Figure 2.5: Flow direction of mixed waters (magenta color) in Lake Rimachi.



Source: Briceño 2005.

Briceño (2005) hypothesizes, after extensive field sampling in the Pastaza basin, that the Pastaza River will drain in the future (uncertain time) directly into the north-northeast shore of Lake Rimachi and will also develop a delta, that in the long term will load Lake Rimachi with sediments. It is unknown when this event will occur, but it can occur progressively or perhaps catastrophically. However, it will have serious implications not only for the different ecosystems in the area and for all the species that inhabit this area, but also for the Kandozi and other people that depend on these resources for livelihood and monetary income (Briceño 2005).

The floodplain has also been shaped by the accumulation of sediments from the Marañon River. Important ria lakes and different types of wetlands have been developed due to this damming effect that the Marañon has had on the Pastaza river system (Dumont 1996; Räsänen et al. 1992). Sediments have blocked the drainage of the lower sections of the fan, and have contributed to the formation of abundant lakes, blocked valleys and large swamps. Lake Rimachi is one of these ria lakes and constitutes not only the biggest lake in the Peruvian Amazon (Santillana 2004) but is also one of the most productive areas within the Abanico del Pastaza in terms of fishing (Anderson et al. 2009).

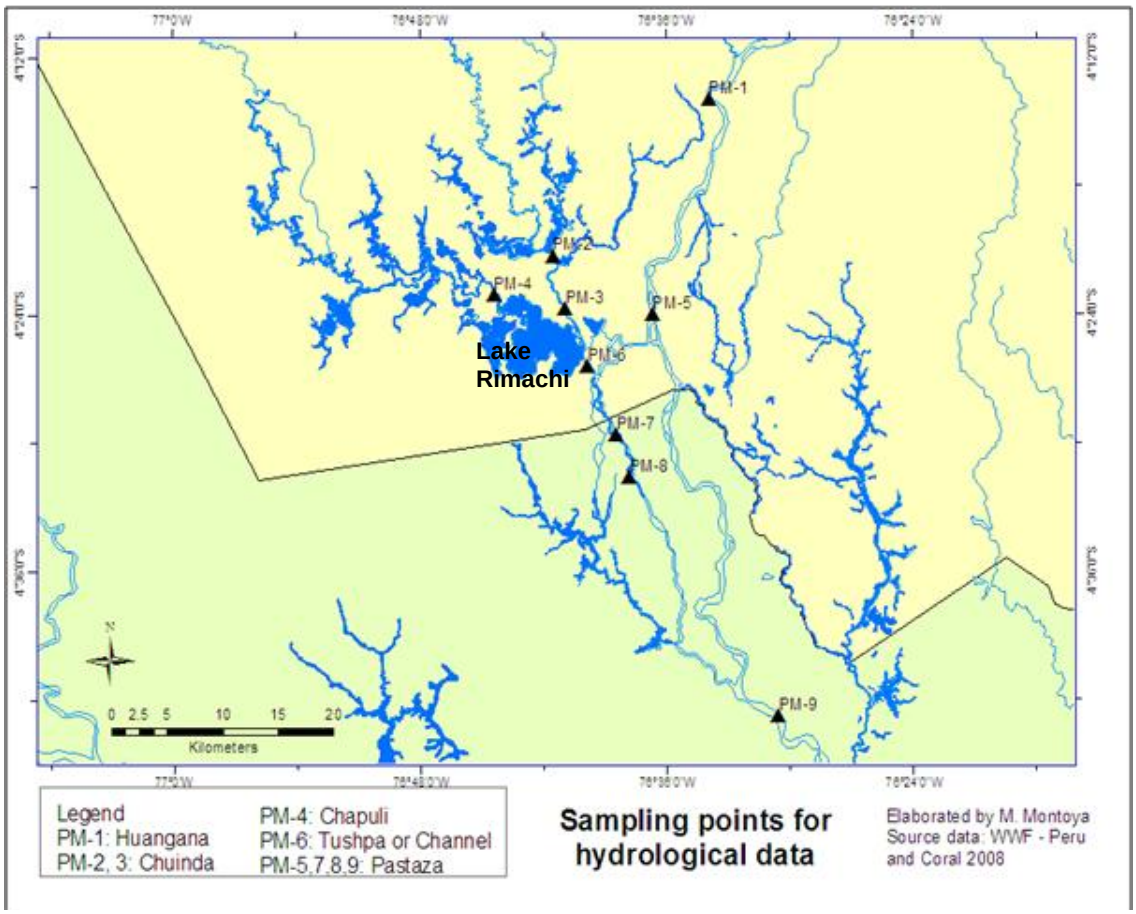
An important aspect of Amazonian ecosystems is not the overall quantity of water transported, but the seasonal fluctuation in water levels (Ferreira Valle and Stohlgren 1999; Junk *et al.* 1989; Kvist and Nebel 2001; Nebel *et al.* 2001; Pinedo *et al.* 2002; Smith *et al.* 2002). Depending on the region and year, the Amazon River and its tributaries overflow their banks, rising from a couple of meters up to 14 meters. For periods ranging from weeks to almost six months there is variable flooding in surrounding forests. A thesis study was done by Coral (Coral Pezo 2008), in which he recorded in nine stations hydrological data from rivers and streams of the Kandozi territory. He found that the different streams and lakes' areas (Figure 2.6) have variations in water level and flow along the year (Table 2.1), which create appropriate conditions for fish spawning and breeding areas in many different places. Fish usually migrate from lakes and rivers to the flooded forest to feed (Rosselli et al. 2004). Further development on of the implications of Coral’s findings will be discussed in chapter five.

Table 2.1: Water level of the rivers in the Kandozi territory

Location	Depth (meters)		Flow (m^3/s)	
	Maximum	Minimum	Maximum	Minimum
Huangana stream	8.60	2.77	781.73	123.51
Chuinda River	9.06	4.31	203.48	28.90
Chapuli River	10.93	4.27	207.21	27.48
Rimachi Channel	8.93	3.03	1010.22	69.69
Pastaza River	7.63	3.57	2611.79	927.26

Source data: Coral 2008.

Figure 2.6: Location of Coral's sampling points.



Hydrological dynamism creates aquatic ecosystems that are uniquely dependent upon, and affected by the periodicity of the flooding (Kvist and Nebel 2001). Water levels affect cycles of local fauna (including fish) and flora that are well adapted to such events (Ferreira Valle and Stohlgren 1999; Pinedo *et al.* 2002; Smith *et al.* 2002). Ecological processes such as plant distribution, demography, fish reproduction and migration are also influenced by rising and falling phases of water in the floodplain (Ferreira Valle and Stohlgren 1999). This is partially explained because the water level also influences ecosystem productivity and physic-chemical characteristics of the water (Rosselli et al. 2004), which in turn will affect plants. People living in such dynamic ecosystems have to adapt to these changes for their livelihoods. This is the situation in the Pastaza area.

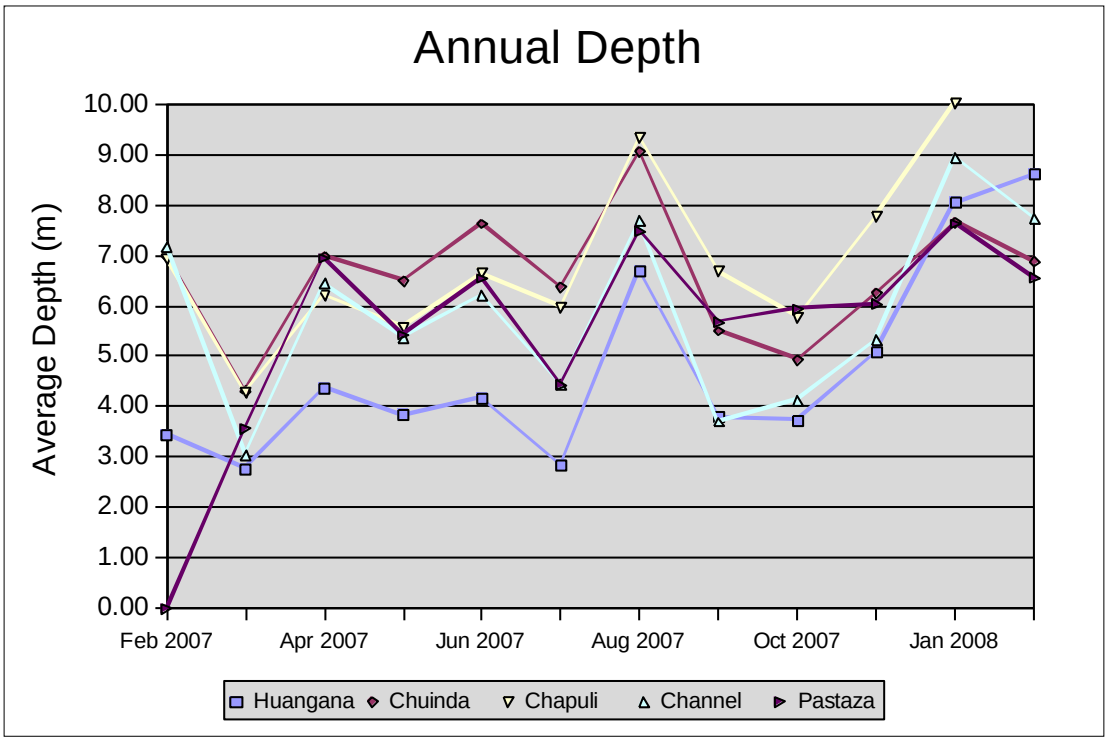
For the overall Peruvian Amazon flooding usually occurs from November to April with some variation among years (Puhakka et al. 1992). It corresponds to several weeks (uncertain number of weeks) later than the maximum precipitation period in the upper watersheds. The Abanico del Pastaza, however, has a different pattern of flooding due to the extent and location of the Pastaza River. The Pastaza is a tropical river situated in the Intertropical Convergence Zone (ITCZ). It has its headwaters in the northern Hemisphere in Ecuador and its end in the Marañon River in the southern Hemisphere. Consequently, the water level of the Pastaza River and its tributaries are influenced by the hydrology in both Hemispheres, showing two flood peaks during a year, as the Congo river in Africa (Latrubesse et al. 2005). One discharge peak takes place during the rainy season in the northern Hemisphere and the other during the rainy season in the southern Hemisphere. Coral's data (2008), show the variability of these discharge peaks in 2007 and 2008 (Table 2.2 and Figure 2.7).

Table 2.2: Average depth of rivers in the Kandozi territory in 2008

	Average Depth (meters)				
Month sampled	Huangana	Chuinda	Chapuli	Channel	Pastaza
February 2007	3.45	6.97	6.91	7.17	0.00
March 2007	2.77	4.31	4.27	3.03	3.57
April 2007	4.37	6.98	6.20	6.43	6.94
May 2007	3.83	6.49	5.57	5.37	5.42
June 2007	4.17	7.62	6.63	6.20	6.54
July 2007	2.83	6.37	5.97	4.43	4.43
August 2007	6.67	9.06	9.33	7.67	7.47
September 2007	3.79	5.50	6.67	3.70	5.68
October 2007	3.73	4.93	5.77	4.13	5.93
December 2007	5.07	6.25	7.77	5.33	6.04
January 2008	8.03	7.65	10.00	8.93	7.63
February 2008	8.60	6.87	10.93	7.73	6.55

Source data Coral 2008

Figure 2.7: Average depth of rivers in the Kandozi territory in 2008



Source data: Coral 2008

Significance of the Abanico del Pastaza Ramsar Site

The two flood peak events of the Pastaza have important consequences for rainforest succession, vegetation patterns, water quality and ecological processes associated with these factors. It has been observed, for instance, that river turtles have two egg laying periods in the Abanico del Pastaza, while in Pacaya Samiria (south of the Marañon River) they have only one, which corresponds to the low water season (Soini 2004). Furthermore, fish species such as boquichico (*Prochilodus nigricans*) have at least two spawning times during the year in the study area, since they spawn when the water level is rising. Fish such as palometa (*Mylossoma duriventris*), lisa (*Leporinus sp*.), sabalo (*Brycon erytrhoptherum*), gamitana (*Colossoma macropomum*) and paco

(*Piaractus brachypomus*) also spawn when the water is rising (usually during February and April) and the Kandozi take this opportunity to fish for them. In October the Kandozi can fish yaraqui (*Semaprochilodus theranopura*) when this specie spawns.

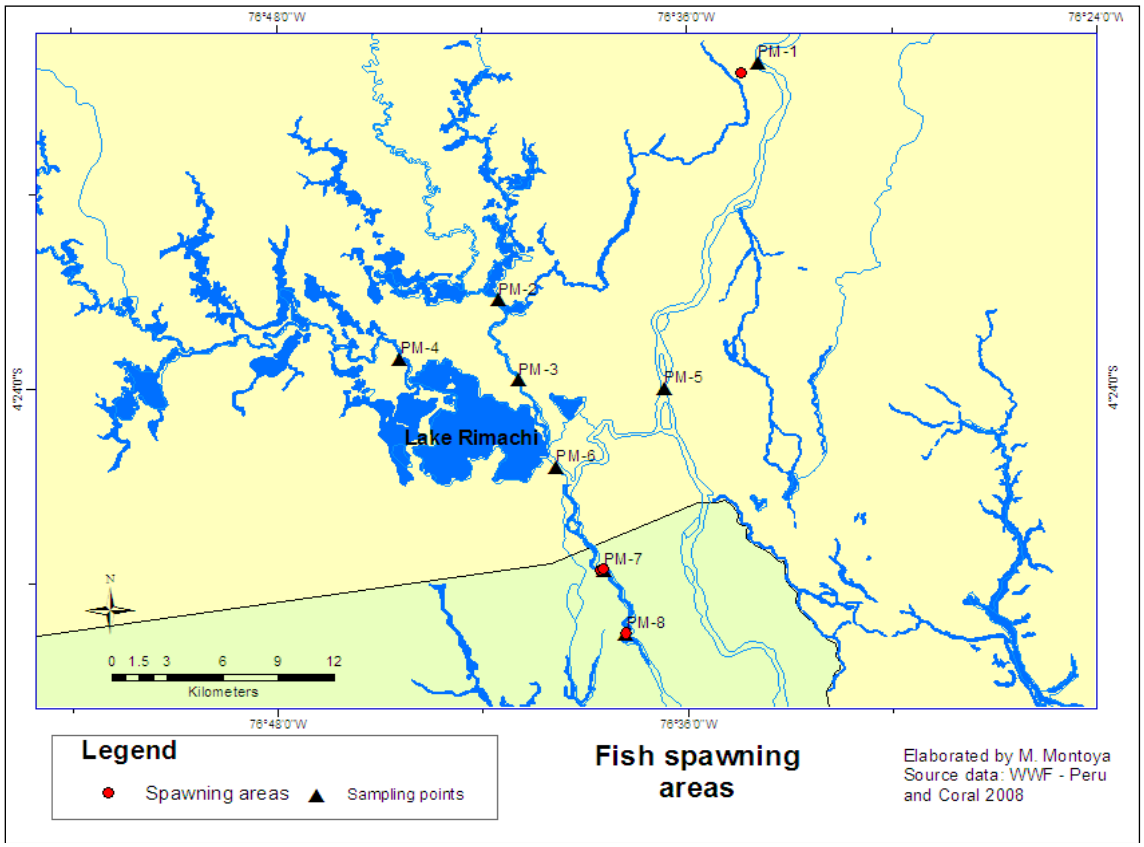
As explained before, the deposition of eroded material from the Andes in Ecuador on the lower basin in Peru creates a plethora of islands and blocked valleys, and forms a mosaic landscape of highly diverse and productive ecosystems, which are key for sustaining fish stocks and other important species in this area (Kalliola and Flores-Paitán 1998). The Abanico del Pastaza is characterized by a patchwork of flooded forests, "aguaje" palm swamps, uplands, and meandering river systems and lakes, that are influenced by complex dynamic fluvial processes, and dependent upon the periodicity of the flooding (CDC and WWF 2001; Nebel et al. 2001). Seasonal changes in water level are one of the key factors that influence fish migration, and it is critical in particular for *Prochilodus* reproduction (Anderson et al. 2009; Araujo-Lima and Rufino 2004).

Rivers have different origins (mountains or lowlands), which have an effect on chemical characteristics of its water. According to chemical composition, rivers can carry white waters, black waters or mixed waters. In general, waters considered as having a white color, will correspond to rivers with sediments of Andean origins. Thus, white waters are rich in nutrients and minerals and have high turbidity. Black waters can be found in local streams and lakes, and are characterized by higher levels of dissolved organic compounds, less dissolved salts and low turbidity. These systems will vary seasonally and can be mixed depending on flooding levels and connectivity to waters originating in the Andes (Carvalho de Lima and Araujo-Lima 2004; Kvist and Nebel 2001; McClain and Naiman 2008). Furthermore, rivers of white water have higher levels of primary production of phytoplankton and more sediments with mineral nutrients,

which favor spawning processes and creates spawning areas (Carvalho de Lima and Araujo-Lima 2004; Kvist and Nebel 2001; McClain and Naiman 2008). The Coral (2008) study shows spawning areas along the Pastaza River, found based on water quality and eggs sampling (Figure 2.8). These areas were coincident with the ones that the Kandozi and mestizo used to fish when the boquichico migrates for reproduction purposes. Additional spatial heterogeneity of the study area includes bodies of water that have black waters, white waters, and areas of mixed waters.

These natural differences in water chemistry (Araujo-Lima and Rufino 2004; Carvalho de Lima and Araujo-Lima 2004) also affect fish migration. *P. nigricans'* spawning areas for example, have been found in areas where mainstream rivers draining the Andes, such as the Pastaza, mix with black waters flowing out from the Lake Rimachi (Illustration 4) (Anderson et al. 2009; FECONAKADIP and Yungani 2007). Thus, the diversity of ecosystems, flooding patterns and chemical characteristics of this area are relevant for both livelihoods and ecological processes such as fish migration and reproduction (Rosselli et al. 2004).

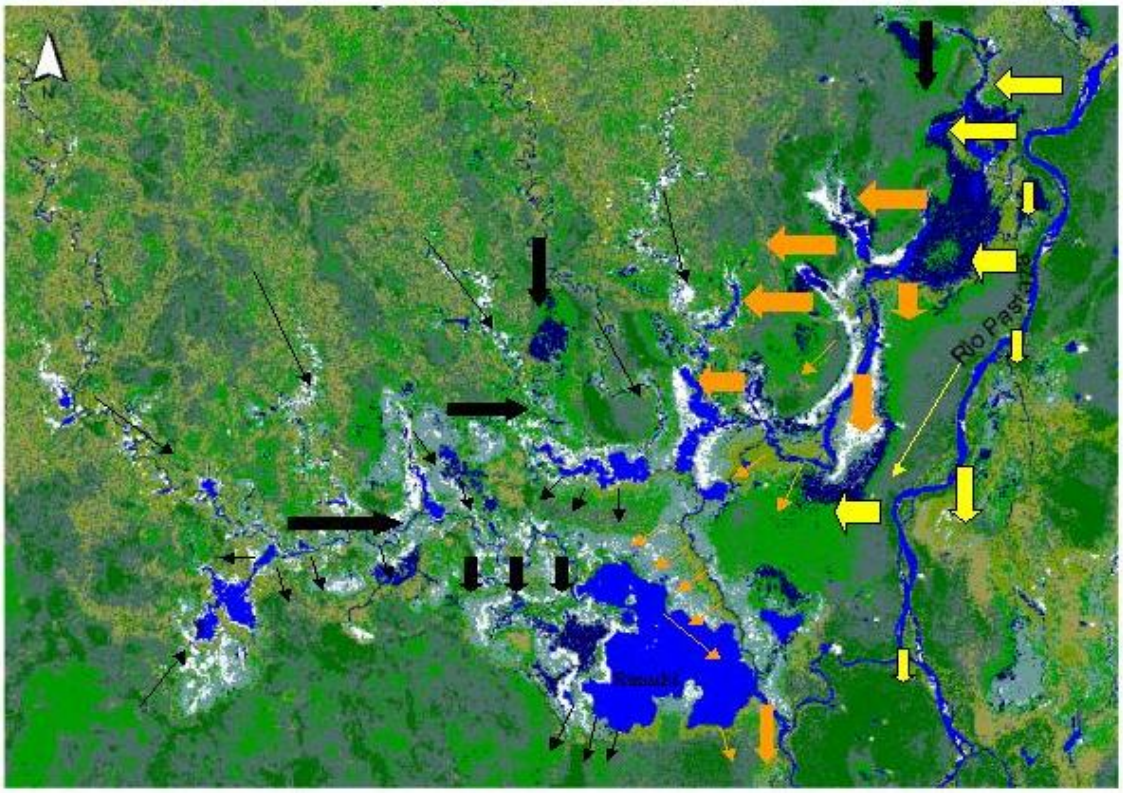
Figure 2.8: Fish spawning areas located in the Pastaza River and Lake Rimachi.



A study done by researchers from Florida International University in Lake Rimachi and in the Pastaza River determined the flow of black, white and mixed water in the Rimachi area. They also evaluated physical-chemical water parameters in these areas. Figure 9 shows an image of Lake Rimachi in which Rosselli and others (Rosselli et al. 2004) found three different water types and their respective directions of flow. Black waters of Amazonian origin (black arrows) move from Chuinda, Chapuli and Pirumba Rivers to Lake Rimachi, while white waters of Andean origin move along the Pastaza River and move west to the Huangana Lake. White waters from the Pastaza River mix with black waters from Pirumba and Huangana Rivers and create an area of mixed waters that flow as shown by orange arrows (Figure 2.9.).

Illustration 4: Area of mixed water, where Lake Rimachi (black water) meets the Pastaza River (white water)

Figure 2.9: Flow of different water types in the Kandozi territory.



Source Rosselli et.al. 2004. Black arrows: flow of black waters; yellow arrows: white waters and orange arrows: mixed waters.

Differences related to the flow and water types influence physical-chemical parameters such as dissolved oxygen, nutrients, pH and turbidity, among others. Rosselli and others (Briceño 2005; Rosselli et al. 2004) found during field work in the Rimachi area low concentrations of dissolved oxygen (below 3mg/l) in June, when the water level was dropping and in black water areas. This is similar to what was found with other such rivers in Brazil (Rosselli et al. 2004). These studies also show that the highest organic concentrations are in black waters, while the Pastaza River (white water) carries inorganic elements. Furthermore, the Pastaza River has the higher concentration of sediments. This heterogeneity in water parameters and concentrations will determine at a

local scale a variety of aquatic habitats. As shown in Figure 2.9, areas of black waters are in the west side of Lake Rimachi, where small lakes of black waters and aguaje palm wetlands can be found. The north-east side of the Rimachi lake is an area of mixed waters habitats, which are used as spawning areas for fish, and as feeding grounds and egg-laying areas for river turtles. Furthermore, different vegetation patches are a result of soil and water characteristics (Briceño 2005; Rosselli et al. 2004).

The heterogeneity of the Abanico del Pastaza Ramsar site is outstanding (Ramsar 2006). It continuously changes due to river processes. The area is also extremely biodiverse, with an abundance of threatened and endangered species such as the black caiman (*Melanosuchus niger*), manatee (*Trichechus inunguis*), "charapa" turtle (*Podocnemis expansa*), spider monkey (*Ateles belzebuth*), giant river otter (*Pteronura brasiliensis*), and the wattled curassow (*Crax globulosa*). The area also harbors some 261 bird species, 66 mammal species, 57 amphibian species, 38 reptile species and 292 fish species, 45 palm species, and at least 804 other trees and shrub species and forest types. Its forests include extensive and relatively well-conserved mixed palm forests and "mauritia" palm forest (aguajales), and such diverse plant species as cedar (*Cedrela* sp.), *Ceiba* spp. and Mahogany (*Swietenia macrophylla*). Some of this biodiversity is included in CITES, IUCN Red List and others (19 CITES Appendix 1, 70 Cites Appendix 2 and 17 IUCN Red list, CE, EN, or TH) (CDC and WWF 2001).

Lake Rimachi

This large lake is located on the right bank of the Pastaza River, covering a surface area of approximately 79 sq. km (Anderson et al. 2009; Surralles 2007). It is also part of a series of interconnected lotic and lentic black water systems. Estimates of fish diversity in the Abanico del Pastaza reported 292 species (CDC and WWF 2001; Willink

et al. 2004) and according to Kandozi fishermen, 21 species are available for commercial use in Lake Rimachi (FECONAKADIP and Yungani 2007) (Table 2.3).

Table 2.3: Fish species used by the Kandozi people

Order	Family	Scientific name	Spanish common name	Kandozi common name
Species preferred for commercialization				
Characiformes	Characidae	*Colossoma macropomum*	Gamitana	Kamitana
Characiformes	Characidae	*Piaractus brachypomus*	Paco	Paku
Osteoglossiformes	Arapaimidae	*Arapaima gigas*	Paiche	Payatsa
Siluriformes	Pimelodidae	*Brachyplatystoma flavicans*	Dorado	Saturna
Commercialization and consumption				
Characiformes	Anostomidae	*Schizodon fasciatus, Leporinus trifasciatus, Rhytiodus microlepis, Leporinus sp*	Lisa (various species)	Sangupa
Characiformes	Characidae	*Brycon erypthropterum*	Sabalo	Ktundarira
Characiformes	Characidae	*Myleus rubripinnis*	Curuhuara	Kunira
Characiformes	Characidae	*Mylossoma duriventris*	Palometa	Kpawari
Characiformes	Characidae	*Serrasalmus humeralis, S. spilopleura, S. matteri*	Paña	Pani
Characiformes	Cynodontidae	*Raphiodon vulpinus*	Chambira	Chambira
Characiformes	Erythrinidae	*Hoplias malabaricus*	Fasaco	Ksura
Characiformes	Prochilodontidae	*Prochilodus nigricans*	Boquichico	Tucuanari
Characiformes	Prochilodontidae	*Semaprochilodus theranopura*	Yaraqui	Yaraquina
Osteoglossiformes	Osteoglossidae	*Osteoglossum bicirrhosum*	Arahuana	Karahuina
Perciformes	Cichlidae	*Astronotus ocellatus*	Acarahuazu	Kukama Tsipshiri
Perciformes	Scianidae	*Cichla monoculus*	Tucunare	Akupchi
Perciformes	Scianidae	*Plagioscion squamosisimus*	Corvina	Wapsa
Siluriformes	Pimelodidae	*Hypopthalmus edentatus*	Maparate	Kazuma
Siluriformes	Pimelodidae	*Practochephalus hemiliopterus, Pseudoplatystoma tigrinum, Leiarus marmoratus.*	Zúngaro (various species)	Tsungaru
Siluriformes	Pimelodidae	*Pseudoplatystoma fasciatum*	Doncella	Tsungaru matiwa
Family and local consumption				
Characiformes	Acestrorhynchidae	*Acestrorhynchus sp.*	Pez Zorro	Kusirama
Characiformes	Characidae	*Triportheus elongatus.*	Sardina	Shapapa
Characiformes	Curimatidae	*Curimata sp., Psectrogaster amazonica*	Ractacara	Ractacara

Characiformes	Curimatidae	*Potamorhina latior*		
Characiformes	Erythrinidae	*Erythrinus erythirnus, Hoplerythrinus unitaeniatus*	Shuyo	
Characiformes	Hemodontidae	*Hemiodus microlepis, Hemiodus sp.*	Yulilla	Shpauro
Clupeiformes	Engraulidae	*Pellona castelnaenana*	Bacalao amarillo	
Clupeiformes	Engraulidae	*Pellona flavipinnis*	Bacalao blanco	
Perciformes	Cichlidae	*Aequidens tetramerus, Chaetobranchus flavescens, Hypselacara temporalis, Heros appendiculatus*	Bujurqui (various species)	Kandashi
Perciformes	Cichlidae	*Crenicichla johanna, Crenicichla sp.*	Añashua	Bornama
Siluriformes	Auchenipteridae	*Ageneiosus brevifilis*	Bocon	
Siluriformes	Auchenipteridae	*Auchenipterus nuchalis*	Leguia	
Siluriformes	Auchenipteridae	*Parauchenipterus galeatus*	Novia	
Siluriformes	Doradidae	*Oxidoras niger*	Turushuqui	Turushuki
Siluriformes	Doradidae	*Pterodoras granulosus*	Cahuara	Kahuaru
Siluriformes	Loricaridae	*Hypostomus emarginatus, Liposarcus pardalis, Ancistrus sp.*	Carachama (various species)	Puturna
Siluriformes	Pimelodidae	*Brachyplatystoma vaillantii*	Manitoa	Tsungaru buishi
Siluriformes	Pimelodidae	*Callophysus macropterus, Pimelodina flavipinnis*	Mota	Chinchingo
Siluriformes	Pimelodidae	*Pimelodus blochii*	Cunchi	Maparati
Siluriformes	Pimelodidae	*Pimelodus blochii*	Bagre	Ataymundo

Source: Bodmer et al. 2005

Lake Rimachi, together with the Pastaza River, were first explored by Juan de Salinas de Loyola in 1559. Salinas mentioned that the Lake was densely populated at that time by "savages" (Santillana 2004). Further explorations were done by other missionaries and by sailors of the Peruvian Navy (Faura Gaig 1962). An excursion to this area in 1929 took missionaries to Lake Rimachi (called then Rima-chuna) and it was described as a great, mysterious lake, with the presence of savages who used small channels to go to the lake. They did not find settlements; people were scattered living in

remote parts of this area. During this excursion they saw large numbers of manatees, enormous paiche fish, taricaya and charapa turtles, big caimans and other impressive animal species. They also found pottery in the area. They believed that what they found could be evidence of a mith (Anónimo 1943) about a lost city supposedly located at the bottom of Lake Rimachi.

The myth about a lost city in the lake is also widespread among the Kandozi. They believe that the land where they live today sank in and then emerged from Lake Rimachi; it is called “tsaponish”. Elderly Kandozi claim that they have seen decades ago vestiges of human life indicating past human presence under Lake Rimachi. These can only be seen when the water level drops significantly (Surralles 2007). According to anthropological observations, pottery remnants can be found surrounding Lake Rimachi, however the potteries' characteristics are not similar to today's pottery used by the Kandozi, and therefore they may represent also the remains of an ancient culture that lived there in the past (Surralles 2007).

The Kandozi believe that there is a submarine world in Lake Rimachi, called “tsogi”. It is thought that the tsogi people behaved badly and as a consequence they were converted into large animals such as the black caiman, the manati and paiche that live today in the lake. The Kandozi fear that they could also disappear if their behavior degenerates. It is also believed that the tsogi life is reproducing Kandozi’s behavior, but underwater (Surralles 2007). This shows the close relation the Kandozi have with Lake Rimachi and with their land.

CHAPTER THREE

The Kandozi people

3.1. LOCATION

The Kandozi form an Amazonian indigenous group that today is found dispersed among several relatively small settlements in northern Peru. These communities are situated along the Manchari, Huitoyacu and Ungurahui Rivers, affluents of the Pastaza River, and also along the Chuinda, Chapuli and Pirumba Rivers, which flow into Lake Rimachi. More Kandozi communities exist in the Nucuray River (Surralles 2007). This study focuses only on the Kandozi living along the Chuinda, Chapuli and Pirumba Rivers, and near Lake Rimachi.

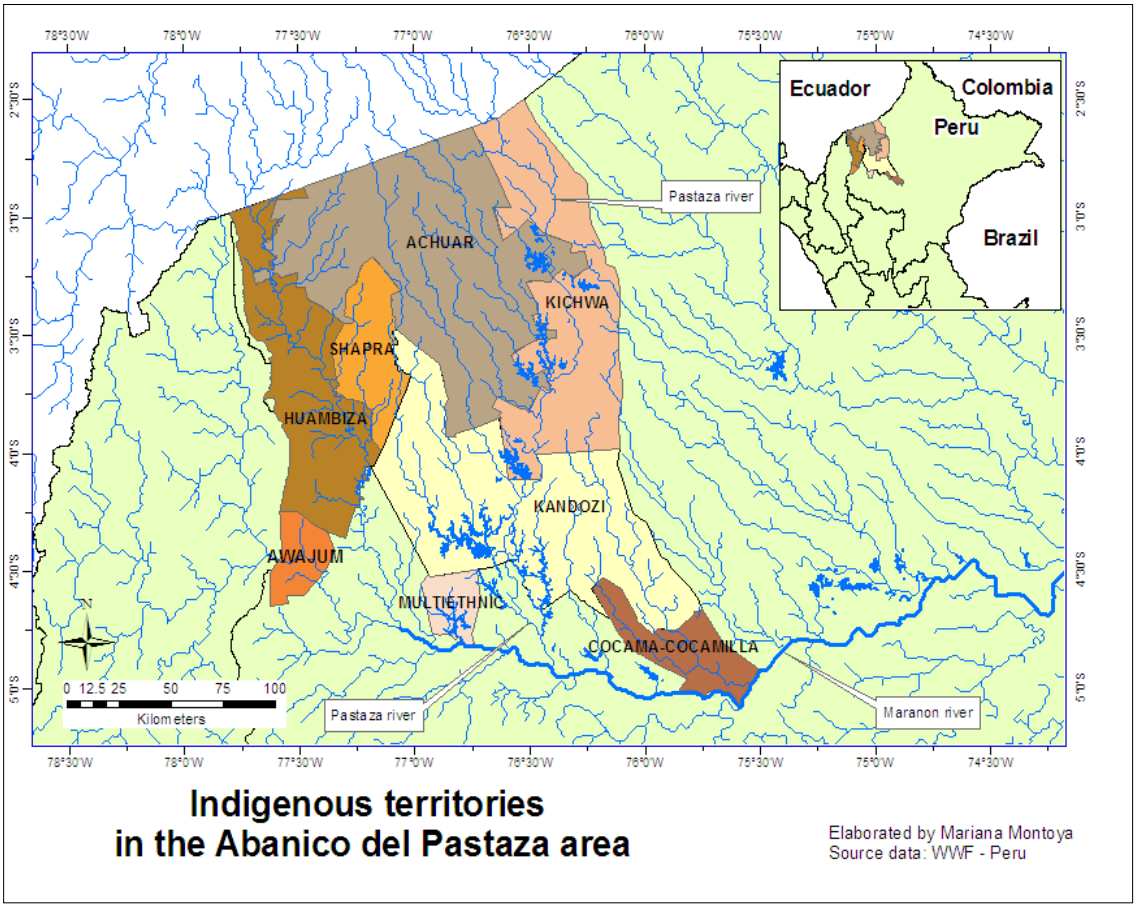
The Kandozi people consider Lake Rimachi the core of their territory. Other indigenous groups, such as the Achuar, Shapra and Kichwa del Pastaza, are contiguous with the Kandozi territory and are also located along the Pastaza River and other of its affluents (Figure 3.1).

3.2. LIVELIHOODS

Natural resources are not evenly spread within the Kandozi territory. Consequently, settlements in the upper parts of the headwaters of the Chapuli and Chuinda Rivers are surrounded by relatively well conserved tropical forest that provides them with game and timber and some fish species. Communities located closer to Lake Rimachi and the Pirumba River occupy a diverse area with palm swamps, lakes, and small streams and rivers that contain more than 200 fish species. In general, the Kandozi territory provides a good supply of natural resources for these communities, who respond with different extraction and management strategies, not only depending upon location, but also upon seasonal and physical availability of particular resources (García 2007b;

Surrallés and García Hierro 2004).

Figure 3.1: Location of the indigenous territories in the Abanico del Pastaza



The Kandozi people have an ancestral relation with their natural environment. Kandozi communities depend mainly upon the harvest of natural resources from their lands. In addition, most of the time it is difficult for them to buy food and other products, due to large distances from their settlements to larger mestizo towns, and their limited economic capacity (Surrallés and García Hierro 2004). Waterways provide the major means of transportation and communication among communities and with larger cities downstream. Because of the relative isolation in which Kandozi live, inhabiting

floodplain and upland areas and near Lake Rimachi, they are highly dependent upon fisheries in particular and on other natural resources such as game and timber as well (Surralles 2007).

Most of Kandozi communities rely on fish from Lake Rimachi not only for subsistence, but also for the generation of monetary income. As in other parts of the Amazon basin, freshwater fish constitute the primary source of protein for indigenous communities and fisheries drive local economies (Coomes et al. 2000; Pinedo and Soria 2008; Pinedo et al. 2000). The Kandozi people also rely on timber and game, but the first is mostly for monetary income and the latter is principally for subsistence (García 2007b).

Subsistence and economic activities in the household are in general differentiated by gender. Women are in charge of domestic activities, such as taking care of the children, and looking after crops and harvest. They can also do some small scale fishing for subsistence, raise small animals and collect fruits and thatch. Women are also responsible for providing clean water, fuel for cooking and for cleaning the house and clothes. Women usually share these tasks with their daughters, sisters, and other close relatives (Ribeiro and Wise 1978; Surralles 2007).

Men are usually in charge of preparing the fields for agriculture and may help women with some agricultural tasks. Men take care of hunting and fishing for subsistence and also for commercial trade. Men also cut timber for sale. Furthermore, they are responsible for building their houses with resources that they collect from the forest, such as wood, fiber and thatch. Work can be done individually or with other men, exchanging labor communally (which is called *minga*). When they work together in *mingas* they do so under terms of exchange and reciprocity. One of the things they have to do is offer

masato, a casava drink prepared and served by women. However, in some cases men are absent from communities, because they are school teachers and work in local elementary schools (Fabre 2005; Ribeiro and Wise 1978; Surralles 2007).

3.3. THE HOUSEHOLD

A Kandozi household is composed of a family that can be polygynous. In addition to the couple and children, young married daughters can also be living in their parent's house with her husband until they have children. The new young couple usually will build a house near the woman's parents. According to ethnographic studies done in the 1990s by Alexandre Surralles, this situation remains the same, as well as the strategy they have for getting married (Amadio and D'Emilio 1983; Surralles 2007; Torrejón Mori 2006) Surralles explains that

> ...the [Kandozi] household is offset by supra-domestic structures, formed by a dozen residences located within a relatively circumscribed space. These groupings [...] are based on alliances between two groups of brothers and sisters who intermarry in order to create a network of solidarity. A warrior-chief of recognized authority, who shares his power with another warrior-chief, leads the group. The relationship between these local groups is one of relative hostility, which can turn into open aggressiveness. Shamanism is regulated by the same logic of aggression. Their idea of social life is therefore founded on a predatory ideology and is based on the conviction that the self is constructed at the expense of the identity of the other. In the past these ideas found their symbolic representation in the practice of head-shrinking (Surralles 2003, p.5).

3.4. HISTORY OF THE KANDOZI

The Kandozi is considered a Jivaro group (Surralles 2007; Surrallés and García Hierro 2004), although there are some discrepancies. Some authors argue that the Kandozi are part of the Jivaro society because of their cultural practices, but are not sure about this identity when using only linguistic criteria (Anónimo 1943; Fabre 2005; Santos and Barclay 2007; Tuggy 1966). Jivaros have certain common cultural practices such as

having inter-ethnic institutionalized wars, a social organization centered on leaders, and a "predation ideology" (Santos and Barclay 2007), in which animals and humans are both considered predators and preys. This ideology explains why in the socio-cultural jivaro system every member of this society searches, possesses, demonstrates and enforces his power over others. For them, power is essential for counteracting other's (human or animal) predation power (Santos and Barclay 2007).

Jivaro men are well known for being great warriors. They fought among themselves and against missionaries starting in the XVI century. Later they also attacked *patrones* from the rubber boom period. The *patrones* were mestizo people who provided in advance with goods to indigenous people and they committed to deliver products. Jivaros have great skills in the handling of guns and their attacks are very well planned. The classic trophies of the Jivaros in the Amazon were their enemies' heads that were shrunken with great expertise (Espinoza Soriano 2006; Fabre 2005; Ribeiro and Wise 1978; Santillana 2004; Surralles 2007; Surrallés and García Hierro 2004).

Colonization and violent encounters

Maynas is at present a province of Loreto but in the beginning of the XVI century, it was a colonial territorial division that included what today corresponds to the Kandozi territory. European expeditions started in Maynas in the second half of the sixteenth century. During that time, three related indigenous groups inhabited this region, the Andoa, Mayna and Roamaina, considered the ancestors of the Kandozi by some anthropologists (Surralles 2007). Violent encounters between the Mayna people and missionaries started in 1635, when indigenous groups expelled Spanish people from the area. As a result of these expulsion, these groups became known for being belligerent people that dominated both sides of the Pastaza River between the XVII and the XX

centuries (Fabre 2005; Santillana 2004; Santos and Barclay 2007; Surralles 2009). It is unclear when Maynas people became known as the Kandozi.

Jesuit missionaries founded several small towns or settlements of indigenous people in the region of Maynas. Missionaries founded these towns to teach indigenous people Spanish life and Religion and to better utilize native's labor. These settlements were called reductions or mission towns (Habig and Espinosa 1946). But by 1769, Spain removed all the Jesuit missionaries from this part of their colony because they did not transform enough indigenous people into Christians (Martin Rubio 1991). Franciscan missionaries were then sent to improve missionary work in the mission towns (Habig and Espinosa 1946). However, after the first removal of missionaries, and after the Franciscans could not establish new reductions, the indigenous populations of the region went back to living scattered in the forest (Martin Rubio 1991). Conflicts among Jivaro groups and between indigenous populations and the white mestizo population kept occurring for centuries with unfortunate results. For example, towns such as San Antonio in the Marañon River were destroyed by the "Muratos" (past name used for the Kandozi people) and many people died in these encounters. San Antonio was attacked around the year 1855 (Monnier 2005).

Pasionist missionaries in 1927 (Anónimo 1943) describe less violent encounters with the Kandozi people (Muratos). The Kandozi accepted missionaries in their settlements, and were willing to be baptized. Nevertheless, missionaries were also witnesses of how the Kandozi attacked the Achuar people and how aggressive they could be with their enemies. These missionaries reported to Spain in 1932 that the Muratos are "savages" who lived isolated from civilization and in a complete "state of barbarism." Thus, other indigenous groups and non-indigenous people feared the Kandozi people.

Such was the number of victims caused by the Kandozi during those years that on one occasion 12 policemen were sent from Iquitos to impose a punishment on the Kandozi. But instead, most of the policemen and other civilians were killed by them. White (non-indigenous) people who survived, escaped from the area (Anónimo 1943).

During the same period, in the decade of the 1920s, mestizos were commercializing rubber, but the Kandozi never allowed them to enter their territory. The Kandozi people took the rubber to the mestizos outside their territory, to a town on the Marañon, where all the rubber from other areas was collected (Monnier 2005; Surralles 2007). Little by little, the Kandozi started to have friendly encounters with mestizos and started to have more relationships with *patrones* in order to commercialize fish, game and timber. However, one of the consequences of these contacts with the exterior was an epidemic that killed hundreds of Kandozi in 1940 according to some authors (Surralles 2007; UNICEF 2005), but little has been published about past time. Other hepatitis events will be discussed in the next section.

Consequences of outsider contacts

The Kandozi territory is an area characterized by a high incidence of diseases such as malaria Vivax and Falciparum, Tuberculosis, Dengue, HIV, and other respiratory and diarrheal diseases. Due to isolation, the Kandozi people are a vulnerable population to other diseases as well, including Hepatitis B. In 2003, the Ministry of Health declared in an official report that the Pastaza district and the Kandozi territory in particular was the region in the country with the highest risk for Hepatitis types B and Delta. In 2000, the average incidence rate for Hepatitis B in the area was 52.2/1000 inhabitants, and it was 106.3/1000 for the group age of 15-44 years. The epidemic of Hepatitis B extended to surrounding areas, but 92% of the cases were Kandozi people (UNICEF 2005).

Hepatitis has been devastating for Kandozi population, not only because of the amount of death and sick people, but also because the state of depression and fear that it caused among Kandozi people. Furthermore, there were several cultural practices, such as the avoidance of using contraceptive methods, that provoked the spreading of the disease (García 2007b). This event contributed to the unwillingness and distrust of the Kandozi to have outsiders in their territory, including oil companies, NGOs and governmental organizations.

UNICEF (2005) suggests that there are four potential causes of the epidemic of Hepatitis B. The first one is related to the oil company activity and the workers that went into the area to work for the company; the second one is due to the trips that some Kandozi did to Yarinacochas in the context of the missionaries from the Summer Institute of Liguistics. A third cause is related to the presence of prostitutes who worked for oil company's personnel and who interacted with the Kandozi. The fourth possible cause is a story about a Kandozi woman married to a Huambisa living in the Shapra territory who died from Hepatitis. These four causes have something in common, contact with outsiders (UNICEF 2005).

For Kandozi people, the massive increase of Hepatitis B around 1996 was principally because of the entrance of Occidental Petroleum Corporation's staff into their territory (Surralles 2007; UNICEF 2005). Alexandre Surralles (2007) in turn, argues that the first contact with Hepatitis was with people from the Summer Institute of Linguistics (SIL), who went there to translate the Bible. But then, with the arrival of workers from Occidental Petroleum Corporation the disease transformed into an epidemic. According to the Kandozi (García 2007b), this epidemic continued because of the incapacity of the Peruvian government.

Luckily, UNICEF Peru started to fund a vaccination program for the Kandozi people in 2003. The goal of this program was to save and prevent infection of newborns with hepatitis. UNICEF worked together with the Ministry of Health in finding a solution for this problem. It took years of work in the area to find a probable solution to the problem, because of cultural barriers, logistic difficulties (García 2007b) and lack of interest from the government. Finally, both institutions developed a strategy by which they were able to apply vaccinations to the Kandozi newborns. Nevertheless, even today people are still dying because of this terrible disease. They keep asking for help from the government but health authorities often do not need the Kandozi's requests (SERVINDI 2010).

Uninformed incursions

Granting petroleum concessions without informing or having communities' consent was and is currently the modus operandi of the Peruvian Government (Chirif 2010). The Peruvian Government in 1993 granted Block 4 with 900,000 hectares to OXY. This concession greatly overlapped with the Kandozi territory, who were unaware of this situation. Only when OXY entered Chapuli River to start drilling an exploratory well in 1994, the Kandozi communities learned about the company. As a consequence of this, the Kandozi wrote a letter to the government to express their opposition to petroleum exploration in the Chapuli River. Several reasons were expressed in the Kandozi's "memorandum" as to why they denied petroleum exploration, one being the potential for contamination of the rivers and the Lake Rimachi. However, OXY did not stop drilling and OXY personnel entered the Kandozi territory. The results of the exploration were negative and because of that, OXY stopped its activities in 1995. Nevertheless, some time after they left, the first symptoms of Hepatitis B and Delta

started to appear in the area (Surralles 2007), as previously explained.

Another similar event happened at the Lake Rimachi. This lake, known also as Musa Karusha, has a long history of management interventions that relate to fisheries by the Kandozi population. In 1945, the Peruvian government established a Fishery Reserve (Reserva Pesquera) in Lake Rimachi as a measure to conserve fish stocks, in particular for paiche (*Arapaima gigas*) and gamitana (*Colossoma macropomum*) species, without any previous consent from the Kandozi. But officials from the Ministry of Fishery instead of guarding the stocks from deprivation allowed mestizo commercial fishermen with large ships into the lake and while simultaneously prohibiting the Kandozi from fishing. This situation lasted from the 1970's until the 1980's (Surralles 2007) (further details in chapter seven).

By 1990, the populations of several fishes, including *Arapaima gigas*, had noticeably declined in the lake (Anderson et al. 2009; Surralles 2007; UNICEF 2005). These declining fish populations alarmed and seriously affected the Kandozi because of their fisheries-based livelihoods. Consequently in August 1991, Lake Rimachi became the center of a confrontation between the Ministry of Fishery and the Kandozi people who gathered in Musa Karusha, the community at the mouth of the Lake. Kandozi fishermen in coordination with the Kandozi Federation (FECONAKADIP) and with legal assistance from the National Indigenous Organization (AIDESEP), took control of the Fishery Reserve's base office of operations in the region, with the goal of forcing the Ministry of Fishery out of the area. Thanks to legal support from AIDESEP (see Box 6 in chapter five for an expanded description of the process), the Kandozi protest was legal, therefore no local authority could stop this action. Since these initial conflicts in the early 1990s and through 2004, the Kandozi people did not have any further contact with

personnel from the Ministry of Fishery.

The Kandozi by themselves succeeded in recovering fish stocks after they agreed to stop fishing for three years on a commercial basis after they took control of Lake Rimachi (Anderson et al. 2009; Surralles 2007; UNICEF 2005). They did not have any conservation non-governmental organization intervention at that time. They received support for fishing conservation later in 2002 by the World Wildlife Fund Peru Office; (further description is in Chapter Seven).

Community foundation

The Summer Institute of Linguistics first entered the Kandozi territory in the 1950s, after signing a contract with the Peruvian government back in 1948 in order to promote the creation of schools in indigenous areas. They were missionaries that through the study of indigenous languages, wanted to translate the Bible and evangelize the Kandozi and other groups (Aikman 2003; Surralles 2007). Thus the SIL produced important transformations of the Kandozi people by first grouping families into communities and then providing them with education. In fact, the objective of grouping indigenous families was to be able to provide education services to a more concentrated group of people (Surralles 2009). This same situation happened elsewhere in the Amazon and in the Andes (Chirif and Hierro 2007). Before the SIL went to the Kandozi region, indigenous people lived scattered in the forest, along small rivers and lakes. Missionaries from the SIL convinced the Kandozi to find areas where they could establish a more permanent place to live. Different families then moved to these areas and legally founded the first Kandozi communities in the seventies. After they were established they could obtain governmental support to establish primary schools in the communities.

The concept of community used in this study is the one defined by the Law of

Native communities in Peru. A community is considered a legal Amazonian entity which has access to collective property. The community concept was taken from Andean communities; nonetheless Amazonian communities have their own characteristics. Community boundaries usually incorporate non-agricultural areas, lakes, rivers, hunting areas, and non-direct used areas. Communities are in practical terms unstable settlements (variable number of people and size) because the people can be sedentary, itinerant, concentrated, and dispersed. In addition, community boundaries are not easily demarcated. Therefore, it is a flexible conceptualization of the space, which according to Chirif and Garcia (2007) helped indigenous people make progress with territorial security processes (Chirif and Hierro 2007).

Organization

Today, the Kandozi group included in this study consists of 2346 people and is located in approximately 40 communities (settlements). The area of the Chapuli River is the more populated with 1521 people, then Pirumba River with 365, Chuinda River with 245 and one community on the Pastaza River, and Musa Karusha with 78 people (Lucana 2009). But only five of these communities have a property title (Table 3.1) and the rest are recognized as annexes (García Hierro et al. 2008). Some of these communities are of very recent creation, because the Kandozi are continuously migrating to establish new settlements. Communities are claimed (Faura Gaig 1962; Surralles 2003) to be socially unstable and therefore they commonly split and form a new one. New communities therefore are not legally recognized by the government until the community starts to do the required paperwork to be recognized.

Table 3.1: Kandozi population by rivers in April 2009.

River	Population	# of Communities	# of Communities with title
Chapuli	1521	30	2
Pirumba	365	6	2
Chuinda	245	3	1
Pastaza	78	1	0
Total	2346	40	5

Formal and recognized communities have a local government system, with a communal assembly. They are legitimately represented by authorities such as the apu (traditional leaders and elders) (Illustration 5), one governor (teniente gobernador) and a municipal agent (Chirif and Hierro 2007). Moreover, the Kandozi communities included in this study are part of two federations. They first organized as "Federación de Comunidades Nativas Candoshi del Distrito del Pastaza – FECONACADIP" in 1990 and, in 1992 they were formally constituted as an organization. FECONACADIP used to include all of the communities from this area, but due to internal conflicts, they split apart and a new organization appeared. This new organization was created in 2009, and is called "Organización Kandozi de Musa Karusha del Distrito del Pastaza – ORKAMUKADIP".

The role of the federations is to politically represent the Kandozi in governmental settings, help communities get education and health services, assist with titling procedures, and in general be a voice in larger scale decision making processes. Both Kandozi federations are part of the regional indigenous organization "Coordinadora Regional para los Pueblos Indígenas - CORPI", which is also part of the national organization "Asociación Interétnica para el Desarrollo de la Selva Peruana – AIDESEP" (AIDESEP 2009).

Illustration 5: Apus from Kandozi communities (first three from the left)

Services and commerce

In terms of services, some communities have primary schools. Primary schools are financed by the regional government and are present only where there are more than forty school-aged children in the community. There are two new secondary schools that have been built by the Kandozi people and the government would support them in theory with teachers.

Musa Karusha community is the only one with a health post with a medical technician and some infrastructure. This is the post that has received support from UNICEF. There are two other health posts, but those are precarious. Besides the hepatitis vaccination that UNICEF provided with their program, the health service that the Kandozi receive is limited due to the conditions of these posts. The government in theory

supports financially the posts, however this support is not enough.

Commercial activities in the communities depend exclusively on outsiders, who - with their boats - visit communities and offer merchandise in exchange for fish, meat, timber and money, selling their products for relatively high prices. Ullpayacu and San Lorenzo are the closest mestizo towns where the Kandozi can go to do commercial activities. Ullpayacu is located south Lake Rimachi on the Pastaza River (3 hours aprox. on a 40hp motor boat) and San Lorenzo is located on the Marañon River, near the mouth of the Pastaza River. San Lorenzo is 6 hours away approximately from Lake Rimachi in a 40hp motor boat).

Titling process

Since 1991 CORPI promoted an initiative among its ten affiliated indigenous groups to secure their territories legally (CORPI 2002). This initiative was based on the concept of managing whole territories and not individual communities. However, the land law did not allow indigenous people to title whole territories (larger non-populated) areas, only communities (smaller portions of land with people living in there). Consequently, CORPI facilitated several meetings among the ten indigenous groups. During these meetings they first delimited their traditional territories by hand on printed maps. Once they agreed on external territorial boundaries, then CORPI helped each group lobby with the state to title as many communities as possible within their territories. The rationale for this was to cover and secure (with titled communities) the entire area of each ethnic group's territory. These territories are not legally recognized by law, hence they did not have a title. But the territories are recognized by the different indigenous groups, and constitute the area that needs to be secured (Chirif and Hierro 2007; CORPI 2002).

As with other indigenous groups in the Amazon (Chirif and Hierro 2007), the

Kandozi have long struggled for rights over their whole traditional territory. Ruled by the "law of native communities" indigenous people started their land titling processes back in 1975. Under that law, a communal title included all the land within the community boundaries. But the 1975 law was modified in 1978. It was declared by the new land law modifications that the forest portion (forest ecosystems) of indigenous communities could not be part of the title. Instead, the forestry area of the community was given as a concession in perpetuity to the people living in there, but not as property. Ironically, this forestry section of the communal area was traditionally used to fulfill subsistence needs, although people were not living there (did not have a settlement in there).

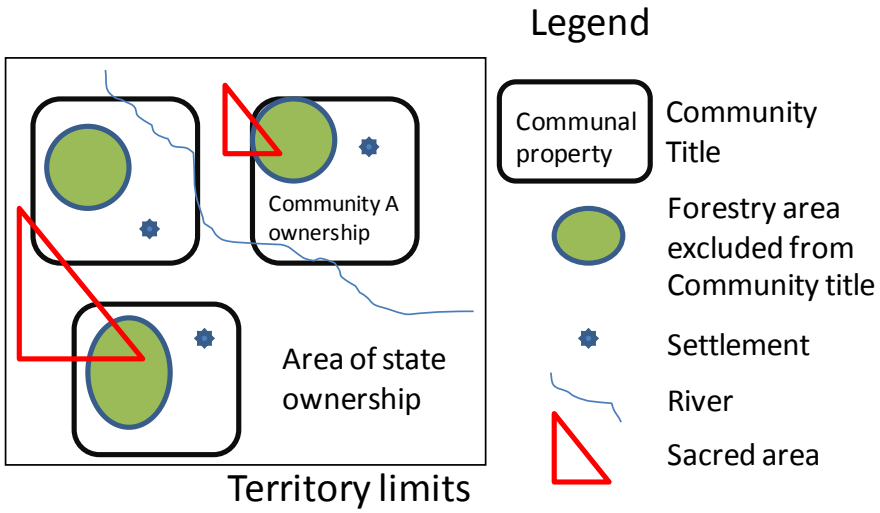
Traditional territories cannot be titled as a whole area. Community titles do not cover either the whole land of the community, where they hunt, or have sacred areas (Figure 3.2). As a consequence, the indigenous territory has been divided in pieces that are independent political units, called communities. In practical terms, this means that communities are located along waterways, leaving a big portion of their traditional territories in legal limbo (Chirif and Hierro 2007; Ryan 2007). These un-titled portions of territory can be claimed by the Peruvian state and can be given to large international companies under a concession, without any obligation to include governance by the indigenous communities.

Regardless of the land tenure of an area, current Peruvian legislation allows the concession of untitled and titled indigenous communities to oil companies or other extractive industries considered of "national interest". These concessions are granted without previous consent by communities (Chirif 2010). Fees paid by oil companies to the federal government seldom benefit local communities directly (Greenspan 2006). This situation has happened in the Kandozi territory, where the state has granted oil

concessions without informing the Kandozi people. Nonetheless, oil operations have not been able to start due to the Kandozi's rejection of this activity.

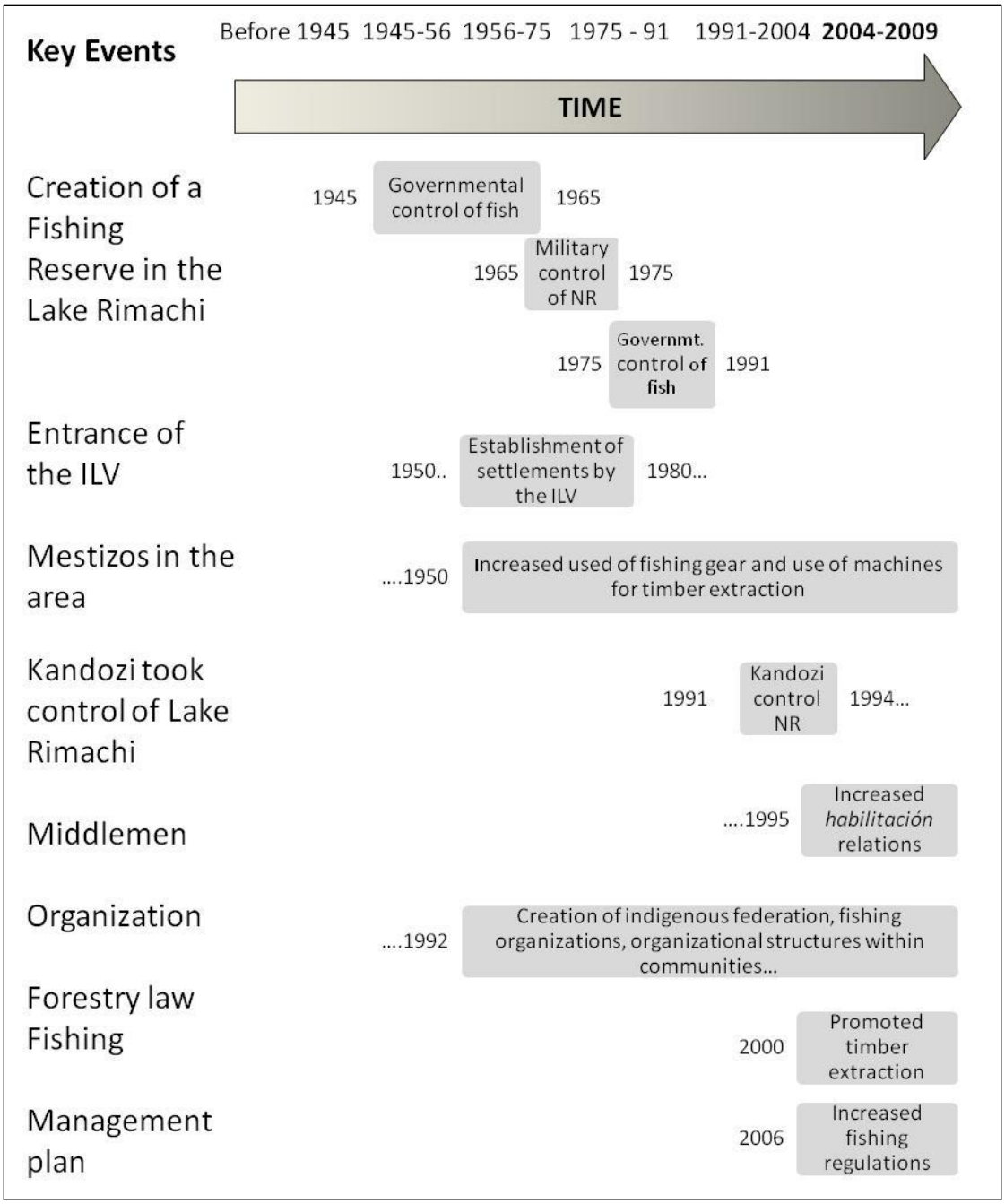
Oil companies need to have a communal agreement to start operations. No Kandozi community has agreed to have oil extraction in their land. They have in addition expressed their rejection to oil exploration through the publication of a letter. Consequently, it has been impossible for the oil company (with a granted concession) to start exploration in the area.

Figure 3.2: Scheme of indigenous territory and community title



All these events in history and other events will be further discussed in Chapter Seven in order to see how the Kandozi people have been changing mechanisms to secure access to natural resources over time. Figure 3.4 shows some of these events occurred over a period of approximately 60 years.

Figure 3.4: Events that have affected access to and control of resources.



CHAPTER FOUR

Methods

This research used a multi-method approach (McKendrick 1999) which combines different methods that complement each other in order to better answer research questions. The methods used in this study were participant observation, open and semi-structured interviews (Whyte 1997) and focus groups with Kandozi people, mestizo fishers, fishing and timber authorities, and experts on indigenous topics. With these methods the factors that shape access to fish and timber by the Kandozi people were identified. Furthermore, data gathered and analyzed in this research helped to better understand the Kandozi perception of well-being and the socio-ecological system.

Historic data and stories told elderly Kandozi was cross-checked with documents when possible or with other testimonies from elderly mestizos that still live in the area or in towns such as Ullpayacu. In addition, the questions of the interviews were rephrased and asked twice (or more) to the same people to verify the answers.

This methods chapter is organized in two sections: a data gathering section and data analysis.

4.1 DATA GATHERING

The data gathering process had different phases, since it included different methods and had both primary and secondary sources. In addition, this research built upon the researcher's knowledge of the area and the Kandozi people, which is based on four years actively participating with the Kandozi people in processes regarding natural resource management, land titling, and decision-making about petroleum concessions in their territory. From 2002 to 2006 I worked for the World Wildlife Fund Peru office

(WWF) and did direct work with the Kandozi. Although I was not collecting data for this study in particular during this time, the experience has been indispensable to: a) reach the people and help to ask them questions for this study, b) develop the interviews and apply them properly, c) to have personal access to, and knowledge about how to interact with the Kandozi people, d) to have a more complete understanding of the study area, which helps in the analysis of qualitative data, and e) to be able to analyze the different factors found to shape access with a temporal perspective.

Period of data gathering

The period of data gathering, including field work and the search for secondary sources specific for this research started on June 2008. This was done in Lima, Iquitos, Yurimaguas and the Pastaza area. Two field trips were made to the Kandozi territory, one in January and February 2009, and the second one in late April and May, 2009. During both field trips, 15 communities were visited (37.5% of total communities) and people from 20 communities were interviewed (Table 4.1). These communities were from the Chapuli, the Chuinda and the Pirumba Rivers and included communities in the upper watershed and in the lower section on the river and surrounding areas of Lake Rimachi such as Musa Karusha.

Another field trip to the Kandozi area was done in July 2007 in order to collect data for two other studies that I did in the area: "Differential Vulnerability of Indigenous People along the Pastaza River in the Peruvian Amazon: A Reconnaissance of the Achuar Lands and their Livelihood Strategies" and "Decision making in relation to environmental and health hazards: The case of the Kandozi people on the Pastaza River of the Peruvian Amazon". Data for these studies have been very valuable for this research as well. These data helped me to learn what the Kandozi have decided regarding oil

exploration within their territories and how oil companies impacted them in the past. Informal interviews done for these studies also provided data for result chapters of this dissertation.

I have co-authored other publications for which I had to analyze information about the Kandozi people. The study about fisheries in the Peruvian Amazon (Anderson et al. 2009), help me with a better understanding of the management challenges that the Kandozi faced in 2005-2006. This provided me with better tools to analyze changes in managements between that time and 2009. A work about conflicts in the Amazon (Postigo and Montoya 2009) gave me the opportunity to analyze and better understand the political context in the Amazon and the implications of land titling. The most recent publication (Sarkar and Montoya 2010) helped me in reflecting on what is needed to reach conservation in areas such as the Kandozi territory and provided me with more elements to give recommendations as part of this dissertation.

Between 2002 and 2006, I visited the Kandozi territory frequently as part of my work at WWF, which allowed me to spend time in the area during both low water season and flooded season. The time period spent in the Kandozi territory was variable, as well as the activities. But all of it allowed me to get to know the Kandozi people and leaders and more importantly, to gain their trust. Without their trust, it would have been impossible during field trips to stay with the Kandozi and have long informal and formal interviews with them.

For both trips in 2009 to the Kandozi territory, I used WWF's boat and facilities in Musa Karusha, and had two of WWF's consultants with me traveling. They were doing their own work on each visit, but they also were present during communal meetings. Similarly, I was present during meetings organized by WWF as part of their projects in

the area with the Kandozi. This situation did not limit my research, because I had plenty of time to talk to people individually and the freedom to decide what to do in each community.

Table 4.1: Communities from which people were interviewed and number of people interviewed

Chapuri basin	Estimated # of people interviewed
Limón Cocha	4 (*)
Nuevo Egipto	12 (A)
Puerto Barranquillo	10 (A)
Ihuaquicocha	1 (*)
Nueva Yarina	13 (A)
Puerto Belén	3 (A)
Nuevo Belén	2 (A)
Puerto Angara	8 (A)
Nuevo Alegría	4 (A)
Aguajal	1 (A) (*)
Domingo Cocha	1 (*)
Nuevo Huambracocha	2
Huambracocha	16 (A)
Anguillacocha	1 (A) (*)
Nuevo Unión	20 (A)
Total people interviewed	98
Total apus interviewed	11

Chapuri basin	Estimated # of people interviewed
Puerto Requena	11 (A)
Musa Karusha	3
Total people interviewed	14
Total apus interviewed	1

Pirumba basin	Estimated # of people interviewed
Puerto Pirumba	9 (A)
Puerto Chingana	12 (A)
Charapacocha	4
Total people interviewed	25
Total apus interviewed	2

(A) Apu was interviewed
(*) Community not visited but people from there was interviewed

Methods for primary data gathering

Previous considerations

Previous to field work, I did a first selection of the 40 communities to be visited, stratifying them based on location (upper watershed and lower watershed, and the three basins) and main activity (communities that fish, extract timber and do both as the main activity). Once in San Lorenzo, this list and the interviews were presented to the president

of CORPI. I explained to CORPI's president what this study was about. He gave me permission to go into the Kandozi territory and start my research. Similarly, I met with both the president and vice-president of the Kandozi federation, FECONACADIP, to whom I also requested permission to start my research. They agreed with my work and offered to be at their communities at the same time of my visits in order to answer the questions I had and to help me with translation. It is worth mentioning that the vice-president was present in Nueva Yarina at the time of my visit. However, the president could not go to Musa Karusha because he was sick with hepatitis and had to stay in San Lorenzo. Unfortunately he passed away a few months after my last visit in May 2009.

Before my trip to the communities, a Kandozi from the Egipto community told me that many of the teachers (who served as translators for the researcher) were attending a course in Yurimaguas, consequently I could have trouble with translation during the visit to communities. This Kandozi offered to accompany me to his community, and to Puerto Barranquito, where he had relatives. Thus, Egipto was the first community visited and from there I started to travel down the Chapuli River to the rest of the communities.

The 15 communities visited during field work were previously selected by me, but I also had suggestions from the Kandozi people in the area. They helped me with translation, and they informed me where I would find people to interview. In each community, one Kandozi communicated with the next community by radio and asked if there were enough people who could talk to me, and also if there was at least one person who could translate. If they confirmed that people were at the community instead of hunting far away, I would go to the next after confirmation and gather my data. People from communities that were not visited personally were interviewed in San Lorenzo or while visiting Musa Karusha

In each community that was visited, the process was the same. As soon as I and WWF's people arrived, I had to first talk to the apu and introduce myself and the rest of the people (WWF's staff). I had to explain to the apu my work, what I needed from them, and asked when I could start. In each community apus decided to organize a meeting with all the people there, in order to explain to them my work and ask them for their willingness to answer my questions. In some communities, this meeting was the same day in late afternoon or in others it was on the next day in early morning. During these meetings, I had to explain why I was asking the questions and then started to interview one by one. The time spent in communities varied between two days to 7 days at the same community. I was always accepted in the communities; nobody rejected me.

Data collection methods

Interviews. A set of semi-structured interviews were prepared for Kandozi households, for communal apus and for governmental officials, mestizo fishers from Ullpayacu and experts on the indigenous movement and the Kandozi. The interviews asked questions regarding fishing, timber and general information about the household. Fishing questions were related to fishing areas, diversity and abundance of the resource, regulations and governance of fishing activities, commercialization of fish and benefits from fishing. All of these questions helped with identifying the factors that shape access to fish and how these have change over time. Management practices were included in the questions to give insights about fishing sustainability. Similar questions for households were asked regarding timber extraction activities (Appendix 1).

Questions for the 14 apus were oriented to collect data on titling processes, governance issues within the community and among other communities, kinship relationships, and questions about how they accessed resources in the past. Interviews to

apus were complementary to the household interviews and both were done in each visited community. In addition, questions regarding overall information from the community (population, foundation, etc.) and about each household (services, food provision, monetary income, etc.) were asked.

Interviews with apus took at least one and a half hour and it was possible to interview them alone or in some cases with a translator. Interviews to households however, were challenging. They would not answer one by one. Instead they answered the questions together, as a group. In five of the 15 communities, one of the interviews was to a single household. But the rest of the interviews in all of the 15 communities visited were as a group. People who were interviewed outside their community also answered alone. One of the reasons for this is that they felt more comfortable answering those kinds of questions together, but also because they were busy in a *minga* or tired from all day activities and wanted to rest. Nevertheless, these questions (to households and apus) were the main source of information to determine the factors shaping access to fish and timber.

After the first field trip, specific questions were asked to fishing authorities (3 people), a forestry authority (1 person), and mestizo fishers (4). Authorities were asked about the challenges they have to build a relationship with the Kandozi and to be able to co-manage their resources. Mestizos were asked in addition what they think about the fishing process and the management plan in Musa Karusha, the commercialization process, the Kandozi organization, etc. These data helped to contrast the data collected with interviews to the Kandozi and consequently informed me about factors that shape access. They also gave insights about mechanisms used to improve access to resources.

Focus groups. In most cases, interviews were done during the meetings

organized by each apu. When interviewing households, the rest of the men were standing there, looking at me and at the person answering questions. Therefore, it was impossible to obtain an answer from a single person. Interviews thus became in practice focus groups. Since interviews were facilitated by a translator, when this person asked the question in Kandozi language, all the people there answered the question, speaking at the same time. The translator gave the answer in Spanish, but this was the agreed-upon answer from a group of people. At the end, they all wanted to answer together. So, most of the interviews to households became in fact a focus group where questions were discussed among the Kandozi and they gave a single answer that represented households from an entire community. In some communities this process was in Spanish and I could understand the entire discussion when the Kandozi were responding the interview. What the Kandozi were in fact discussing were details about each questions, but in general terms they reached consensus easily. I would say that they were not arguing about the answer, they were trying to explain me all the details about my question, and everyone wanted to give his opinion.

When the group was more than 10 people, I asked them to separate in at least two smaller groups. For each group, I asked all the questions and while the Kandozi were discussing the answers I was taking notes of these conversations that went beyond the specific question. At the end, these focus group discussions, guided by the questions of the interviews, were very rich in data for determining the factors shaping access and background on the area and the Kandozi people. Questionnaires for the focus group were applied in all 15 communities visited by the researcher. The estimated number of people interviewed is calculated based on the people participating in the focus group, adding the people for whom it was possible to interview one by one. The estimated number of

interviewed people is 137 Kandozi (Table 4.1), which corresponds to the 5.8% of the total of the Kandozi population (Table 3.1).

Questionnaire. A specific separate questionnaire to fishers of all ages was also done to ask them about monetary benefits from fishing and management practices (Appendix 2). This was complementary to interviews but since it was shorter and had more personal information, they wanted to answer individually and preferably without any other Kandozi listening in. The questionnaire asked about how much fish they had caught in the last season, how much money they earned from it, how they spent it, if they had captured fish eggs or paiche and overall information about the fishermen. These data were helpful to understand differences among ages, what fishing means for Kandozi's livelihood, and how dependent they are on this activity. I and one of the WWF's people who accompanied during the field trip did this questionnaire together. Seventy seven Kandozi fishermen answered the questionnaire. The same data will be analyzed for other purposes by WWF's staff. Not all the 77 fishermen answered all the questions. Complete data was available for 67 people. Ages from these fishermen vary between 13 and 60 years and people were interviewed from 13 different communities.

During this questionnaire in particular, WWF's presence was important. The person who was doing the questionnaire has been in the area since 2002 as a biologist supporting the Kandozi with fishing practices. So, the Kandozi know him very well, and trust him enough to give him personal information. In addition, this biologist understands the Kandozi language and knew enough words to do the questionnaires in Kandozi when it was necessary. He introduced me to the fishers and taught me some words needed for the questionnaire, but in most cases he did the questionnaires in Kandozi and I did it in Spanish. This was important in order to avoid translators who could have altered the

answers given by the Kandozi fishers.

Participant observation. I also participated in daily household activities such as mingas, fruit gathering, fishing (Illustration 6), cooking, communal meetings, and in decision making processes regarding fish control activities. For example, I was in a Kandozi meeting in Nuevo Union where they discussed how to better control their lakes from mestizos and from other Kandozi who were contracting mestizos to fish there. Although this meeting was in Kandozi, I had the opportunity to have one Kandozi translating the discussion to me. I also had the opportunity to observe daily life in communities in the lower basin as well as in the headwaters such as Egipto.

Illustration 6: Fishing in Lake Union (Participant observation)

Participant observation of Kandozi's daily life during field work in 2009 together with observations from previous years, allowed me to better understand environmental differences among communities and its effects on resource access and livelihoods. It also provided insights about the decision making processes and how internal regulations operate. Value-based information about quality of life and how they perceive their own well-being was collected during this process. Observations and conclusions in the results chapters are based on the totality of these experiences.

Informal interviews. During my stay in Kandozi communities, I had the opportunity to have numerous long (at least two hours) informal interviews with apus, Kandozi leaders (Illustration 7), households and also with women and young people. These interviews provided data on historical events, such as the confrontation in Lake Rimachi in the 1990s, about relationships with loggers and fishers back in the 1940's and 1950's, past Kandozi's traditions (50 years ago approx.), as well as gender differences in daily activities. Informal interviews were also used to talk more in detail about the questions of the semi-structured interviews and to confirm the answers. Furthermore, these interviews during participant observation elucidated what they know about legal frameworks, and how much they value an education today in comparison to decades ago. Interviews were between me and one Kandozi, or sometimes with a group of Kandozi people.

Data on community establishment was gathered during informal conservations. I asked about the relationship among apus of each community and how they were related to other apus from other communities. These data was used to understand how each community is related to each other and how kinship explains access to fishing areas, hunting trails and timber permits. This data was validated by asking similar questions to

different people in different communities.

During informal interviews I also asked women, elderly Kandozi and young people what do they want in the future, what are their needs, if they are satisfied with the life they have. These questions motivated long conversations with Kandozi people and were key for gathering information for the chapter about well-being. This information was complemented with interviews with indigenous experts who work with other ethnics groups in Peru and Latin America, such as CAOI (Andean Coordinator of Indigenous Organizations).

Illustration 7: An open interview to a Kandozi leader during breakfast.

Georeferencing. I georeferenced sites during field work, in order to better locate fishing areas, fishing camps, and small lakes of the Kandozi territory. This was done by traveling by boat through the different areas and using a Garmin GPS provided by WWF. A local Kandozi guide together with the WWF's biologist helped determine location and name of each fishing place.

With the GPS points obtained in the field, I prepared a map using ArcGIS 9.1 with the names of all the places and this map was shown in the second field trip to other Kandozi people to confirm names and location. The Kandozi also confirmed if each of those areas were the areas they access to fish for subsistence and for commercialization.

Archival data collection

Archival sources of data consisted of books, published and unpublished reports, journals and documents such as property titles and maps. In order to access these sources, I visited several libraries: The Benson Latin America Library at the University of Texas at Austin; and in Peru, the Amazonian library ("Biblioteca Amazonica") in Iquitos. In Lima I visited the Center for Conservation Data at the Agrarian La Molina National University, the library of the French Institute of Andean Studies, and the National Library of Peru.

Other sources were provided by the office of WWF (unpublished reports about their work in the Kandozi area, forestry inventory and fishing management plan, among others), the governmental fishing regional office at Iquitos (fishing laws and regulations), and the forestry regional office at Yurimaguas (forestry law and requirements to extract and commercialize timber).

An unpublished vegetation map was provided by WWF and was used to analyze environmental heterogeneity. For completeness of the methods here is a description of

how this map was done. Its preparation was part of the Rapid Ecological Assessment done by the Center for Conservation Data – CDC and the Research Institute of the Peruvian Amazon – IIAP. It was elaborated based on six Landsat satellite images TM-5 (007-062, Sep. 07, 1985; 007-063, Aug. 06, 1985; 008-062, Nov. 08, 1996; 008-063, Dec. 16, 1984; 009-062, Sep.11, 1987; 009-063, Sep. 11, 1987) with 7 bands, Radar images (JERS-1), Aerial Photos (Projects AF-60-17, SAN-9220, 9352), and videos filmed in 2000 and 1995 by IIAP and CDC respectively, and field work to verify the final stratification.

During the first field trip in January and February (2009), WWF hired a consultant (G.Lucana) to gather data on the health of the Kandozi and to prepare a socio-sanitary base line of Kandozi families and communities oriented to prepare an integrated health plan. Before Lucana and I started visiting Kandozi communities, we agreed on the data that we would gather in order to avoid asking the Kandozi people same questions twice. Consequently, we decided to share the data when necessary. Thus, data on the census collected by Lucana have been used for this study with her and WWF's permission.

4.2 DATA ANALYSIS

Analyses of interviews, focus groups and participant observations

Data from interviews, focus groups and participant observations were recorded on a combination of answer sheets and field notes. While transcribing these data, general and specific topics were identified. An Excel template was prepared with the different topics identified that were related to factors shaping access, and transcription was done following this template. So, specific answers from interviews, observations and discourse

from focus groups were grouped according to topics and then they were analyzed one by one. The analyses aimed to find consistency and differences between answers regarding factors shaping access. Since all of the answers from interviews and focus groups were open informant, they were analyzed together with field notes from participant observation. This analysis was first done during and after the first field trip and was further refined after the second field trip.

Analysis of informal interviews

Informal interviews were registered in field notes that were then transcribed onto the Excel sheet grouped by topics. Analysis of each topic, and relating it to others, was used to support determination of the factors shaping access. This information also helped to better understand Kandozi history, culture, perception of their environment, expectation for the future, well-being, and what they perceive as benefits obtained from resources.

Questionnaires

Quantitative data from the questionnaires was collected in Excel sheets. One sheet contained data on materials, species, production, prices, gains and expenses, and general information for all 77 Kandozi interviewed in depth. This data was explored to see differences on income distribution and expenditures patterns. Data on fish earnings, length of fishing period and how these varied according to group ages were analyzed using descriptive statistics (SPSS software ver.13).

The second set of data regarding expenditures of each Kandozi fisher was analyzed in Excel. The 77 questionnaires were consolidated in a single sheet and itemized expenditures were grouped to analyze how the Kandozi used their money. Expenditure

patterns were first analyzed for the entire sampled population and then by age. In order to do this, expenditures were classified arbitrarily in categories. Items were included in the different categories based on literature and also based on my own observations in the field.

Georeferenced data points

A table was created with the georeferenced points taken with GPS of fishing areas, fishing camps and lakes in data base (dbase) format and it was imported into ArcGis 3.1. I already had a geodatabase that I prepared in 2007 of the Pastaza area using data provided by WWF. The complete geodatabase of the Pastaza area was updated with the new points. I prepared maps of these areas using ArcGis 3.1. These maps helped to visualize location of these areas in relation to location of the communities.

Vegetation map

The vegetation map provided by WWF was added to the geodatabase of the Pastaza area and was compared to the communities' location. By preparing a map with communities and the different vegetation types, it was possible to visualize the diversity of patches that surrounded communities in the headwaters and in the lower portions of basins.

Due to difficulties in swamp classifications, they are commonly treated as one type of vegetation formation. However, Kalliola and others have described the swamps of the Abanico del Pastaza based on physiognomy (Kalliola et al. 1991). They identified different types of swamp vegetation - including herbaceous swamps, oxbow lakes, palm swamps, forest swamps, and shrub swamps - that respond to inundation patterns, aggradation, geomorphologic processes, type of waters and hydrology. A similar

classification is used in the vegetation map analyzed in this study. Vegetation data was complemented with interviews about what kind of surrounding habitats the Kandozi use in their communities.

Differences among economic activities

In order to better understand variations among main economic activities in relation to community location, information about main sources of income were visually represented on maps. Using ArcGis 3.1 I prepared three maps showing in the first one the main source of income of all Kandozi communities, a second map with the second source of income, and a third map similar to the other two. I did the same maps for a community in particular, as a closer view of these differences. Maps were visually compared to each other.

These same data were explored through tree models (regression maps), using SPlus software. The first step to do this was to create additional variables to the model. I first calculated a Shannon index of landscape diversity at the community level. Using ArcGIS 3.2 I created a 4km buffer around each community. I decided on 4 km because it was an approximate average distance of for daily hunting, fishing or gathering. These buffers contain the data on vegetation so, when extracted, each buffer had the settlement (a point) in the middle of the circle and vegetation polygons representing the different vegetation types. Each buffer was saved as an independent layer. Then, using the Patch Analyst software I calculated a Shannon diversity index for each buffer layer.

Two categorical variables were additionally created. I established for each community its land tenure status, and if they have access to fishing areas. Regarding land tenure the categories were as follows: Category 1 for communities with a title, 2 for the ones in process of getting a title and 3 for communities that were annex of a titled

community. In the case of access, communities with exclusive access to fishing grounds received number 1 for this category and 0 when they did not have exclusiveness.

Once these variables were created, I added to Table 5.5 five more columns: Coordinates X and Y, the Shannon index, land tenure and access. This table was then used in SPlus to process a regression analysis using tree maps in order to explore which of these variables explained why a community chooses fishing, hunting or timber extraction as a main source of income.

Tree models were constructed using all the combinations of the variables and single variables. The residual mean deviance and misclassification error rates of all the trees constructed were analyzed. The model with the lower residual mean and lower error was used to explore which variables explained the main economic activity for that particular year and season.

Archival data analysis

Legislation on land titling, fish and timber extraction was analyzed in order to examine how they are shaping access. Access patterns were evaluated by analyzing implementation strategies, enforcement, and changes over time, requirements, and other common set of elements that were contrasted with interview data. In addition to governmental documents, I also analyzed communal minutes, management plans, and local rules of access regulating access to better understand local implementation of rules.

4.3 PERSONAL POSITIONALITY

Past work as a WWF officer

Between 2001 and 2006 I was part of World Wildlife Fund Peru (WWF-Peru), an international non-governmental conservation organization that was and still is involved in

promoting and implementing natural resource management and conservation projects with Kandozi communities, among several other conservation-related projects. I first started to work with the Kandozi people in 2002 because of WWF's interest in the region as a priority area for conservation. At that time I did not know anything about the Kandozi people, and very little about indigenous people's struggles in the Amazon.

During the time working in the Pastaza region, I was astonished not only by the beauty of the area in ecological terms, but also because of the courage of the Kandozi people. I was also amazed by the way they relate with and know about their environment. It was also fascinating to learn about their life view and the rules they have for different behavioral aspects of their life. The more I learned and interacted with the Kandozi people, the more interested I was in knowing how they use their resources. However, I also started to learn about all the struggles they had to face and all the conflicts not only with the government but with oil companies and loggers. Those struggles raised environmental justice issues and motivated me to better understand their situation and root causes of these contestations and to find ways to help them through the activities I could do in the area.

After four years working in the area, I felt I was too involved with people's problems. I started to feel that I was losing objectivity, so I decided to step back and take some time to try to better understand these conflicts. My biology and ecology background was not enough to find solutions that could help this people to overcome the conflicts. In addition, being part of WWF did not give me the freedom to do other things I could do, either because I did not have the funding, or because they were not supposed to be done by a conservation organization, like working on health topics. So, that is why I decided to resign and start graduate studies in geography. I thought that learning new things could

give me the tools and ideas to better contribute to the Kandozi people.

During the last three years in graduate school I have had time to learn and reflect on different issues about the Kandozi people from a more academic and social science perspective. Now I realize that I was too ambitious when I tried to solve all their conflicts, with only a few projects for poverty alleviation and conservation. I realize now that the struggles the Kandozi have to face are part of a larger system that will not change soon, if ever.

During my research I made a conscious effort to avoid biases in my observations of analysis. I could have selected another area for my dissertation but I did not because I feel I have a commitment with the Kandozi people and I feel I still have an obligation in helping them to choose the type of development they want for their "pueblo".

Data collection

My position as an ex-WWF staff from Lima gave me several advantages but also challenges during the information data gathering processes later, in 2009. Usually in Lima being part of a well-known international organization was an advantage whenever I wanted to get data or any other information from the government or other local NGOs. However the Kandozi people originally did not have any idea of what WWF was. When I explained in 2002 that it was a conservation organization they had a negative reaction and automatically rejected working with WWF. Thus, it was very difficult for me at the start to establish a relationship with the Kandozi and to build a work plan together that satisfied their needs, but also satisfied donor expectations.

However, after two years working with them (2002, 2003), learning from them and being honest with them about the reason why WWF was there, they started talking to me in a different way. They told me that now they could tell me directly what they

wanted to do and that we could start working together. Being a woman did not help me either. They always tried to talk to my male colleagues. They did not want to talk to a woman. But after a few years later they felt much more comfortable talking to me. One of the leaders once told me that when he realized that we could disagree with each other, he decided to talk to me directly. He also told me that when he realized that he could tell me anything and I did not get mad at him, and contrarily, I was willing to negotiate our differences, then he decided that he did not need an intermediary between us. That interview was an important lesson to me and only then I was aware of how being a woman could complicate things so much, especially with the Kandozi people, but also how significant were their words when they said they trust me.

My past work at WWF facilitated the archival data gathering process during this dissertation research, since I knew what was available, what was unpublished and where to find all the information I needed. In addition, governmental regional authorities knew me from before, so I could visit them, explain my new position and they were willing to give me the information I requested. We also had long conversations in which they answered my questions. Most of my interviews were friendly chats with people that I knew from before. And when I had to interview unknown people, I had no problems in having in depth conversations with them because of my previous knowledge of the area.

When I interviewed mestizo fishers at Ullpayacu my new position in 2009 was the one that helped me to approach them. They did not agree with WWF's support to Kandozi fishers. So, this time it was much easier to approach fishers than in the past. This time they were sincere with me in telling me what they disliked about WWF. They even told me how they illegally operated in spite of fishing authorities. In conclusion, what I had to do was to remind some people that I used to work with WWF, but that this time I

was doing my own research. In some other cases, when people did not know me from the past, I emphasized that I was doing research, without talking necessarily about my past in WWF.

Most of our differences in the past between me and the Kandozi were about the contract between the Kandozi organization and WWF, and how much money was assigned to them. It was possible that the change of attitude that they had with me in 2009 compared to in the past (2003), was because they realized that if they wanted some support from WWF, they had to talk to me. If this would have been true, it would have been a major difficulty to approach the Kandozi people. In addition, I was afraid that it would be difficult for some of them to understand that I was not part of WWF anymore, that I was not able to financially support them. Before starting field work in 2009 I was looking forward seeing how much they really wanted to work with me as an individual and not as WWF's staff. But in the end, everything turned out better than expected.

Consultancy work at WWF and field strategy with the Kandozi

Between January and June 2009 I was a part-time WWF consultant. I was contracted to develop a socio-economic study of Kandozi communities emphasizing natural resource use. During the trips I did to the Pastaza for my dissertation, I also gathered data for this consultancy. Some of this was useful for both studies, but I also gathered additional data for the consultancy report. Therefore, I was also visiting some communities with WWF's staff who were supporting field costs for the consultancy.

I was aware that my situation in the field could be difficult to understand for the Kandozi. I was an ex-WWF's staff, but was also a temporary consultant and also a doctoral student. So I had to be very careful to explain what I was doing there, and also I had to separate my observations for the report and for my own study. But in spite of all

this, my situation was advantageous regarding my relationship with the Kandozi. They already knew where I was coming from, what I agree or disagree with and my willingness to help them.

Explanations to the Kandozi were more difficult as expected. When I talked to leaders or in general to better educated Kandozi, they understood my new affiliations. However for others, it was more difficult for them to understand that I was studying "again". They knew I was already a biologist in 2001, and did not understand why I had to go to the university again. Nevertheless, what was clear for everybody was that I was not part of WWF anymore and that I was only collecting some data for a report for them. It was interesting to hear a Kandozi when he told me that now that I was not part of WWF, he could tell me more things than before, not only for my own study, but also to incorporate his comments in the report to WWF and see if they could improve their work.

There were occasions in which a few Kandozi people approached me to ask for modifications on WWF's project, or for additional financial support. But as soon as I clarified that I was not part of WWF, the conversation would turn into an explanation of why they were asking about project modifications. That would give me the opportunity to have more in depth interviews with them, reflecting also in what happened previous years with WWF's activities related to access to resources. In every encounter I had I felt they had more freedom to talk to me, because I was not the "boss" anymore. Furthermore I did not feel they had trouble with me being a woman. We talked about everything. In fact, during both field trips I had the opportunity to interview women, something that I was not able to do in the past. What a woman told me during a conversation in 2009 was that now they could talk to me because I was like them; I was not a "curaca" (chief) as in the past. I explained my affiliation as many times as needed to all the people to whom I talked.

Being a student in the area, and not having coordination or supervision duties as in the past, allowed me to participate in more daily Kandozi activities, and gave me the opportunity to share and learn more from the Kandozi. It was an enriching time for me and I had constantly to focus, and to not lose track of the goal of my presence there. I tried all the time to reflect on what I saw and heard every moment in order to answer my research questions. However, sometimes it was difficult because conversations with the Kandozi were rich and full of other topics. At the end, the Kandozi made me feel as their friend, and gave me the opportunity to learn how they interact with their environment. It was a very satisfying experience (Illustration 8).

Illustration 8: Apu Pandama invited me to drink a coconut with him

CHAPTER FIVE

Factors shaping access to fish and timber for the Kandozi indigenous people

5.1. INTRODUCTION

In traditional indigenous economies, nobody can be excluded from the usufruct of the land for their own subsistence. In this sense, the Kandozi territory has been traditionally considered an open access system by them, where no access rules were in place. Fish were caught from rivers, lakes and small streams. Forest and wetlands were used in their totality, including as sacred areas. Timber, pole-wood and thatch were commonly used to build houses, canoes, and utensils (García Hierro et al. 2008; Surralles 2007). However, as has happened in other cases (Bremner and Lu 2006; Lu 2001; Sarch 2001; Sarkar 2008), the people started to develop rules of access to natural resources, resulting in mixed systems of access that include a gradient of open access to exclusive access to resources and extraction areas.

The possibility of using large extensions of environmentally diverse land allowed the Kandozi people to be able to diversify livelihood strategies and cope with environmental dynamic - spatial and temporal – processes and hence reduced their vulnerability as in other places of the Amazon (Kvist and Nebel 2001; Kvist and Nebel 2000; McCay and Jentoff 2002; Pinedo *et al.* 2002; Schmink and Wood 1987; Smith 2002). However, it is precisely this spatial and temporal dynamic that will determine resource density, distribution and availability, what in turn will determine if the Kandozi can have access to resources or not.

Livelihood studies in the Amazon (Pyhälä *et al.* 2006) and on pastoral resources elsewhere (Butt 2010) have unveiled the spatiality of resource use. They show how

decisions for resource use depend upon spatial and temporal availability of a diverse array of resources. Fisheries studies (Martin 2001) add to this notion of spatiality by claiming that the environment cannot be assumed as homogeneous. Furthermore, they argue that depending upon the scale of study the spatiality of resource use can be better understood. This is also true for the Kandozi. The Kandozi people know their environment and at a particular scale they identify different fishing grounds, fish migration routes, forestry areas, among other habitats, and as a consequence they have delineated boundaries to govern access to resources. Recent studies in geography (Butt 2010) have demonstrated the complexity of this indigenous spatiality and how it depends upon complex social-ecological relationships. Nonetheless, this spatiality has not been incorporated in access studies as a factor that shapes how people can have access to natural resources. Consequently, this chapter shows how spatiality and temporal variability are determinant factors that shape access to fish and timber by the Kandozi people, and is one important contribution of this dissertation to access literature.

Uses of natural resources and livelihood strategies by the Kandozi people not only changed across space, but they have also changed through time. They have transformed their subsistence economy into more of a mixed economy, in which they combine some commercial activities with subsistence (Surralles 2007). As a result, now they have to face new forces that affect rules of access and natural resource extraction. In addition, the intricacy of the socio-ecological system involved, and the multiple stakeholders' interests present today in the Amazon, challenges the rational use and governance of natural resources and an equitable distribution of resource use benefits (Adger et al. 2005; McGrath et al. 1993). In this context of multiple claims (Montoya 2007; Postigo and Montoya 2009), securing access to and control over natural resources is critical for

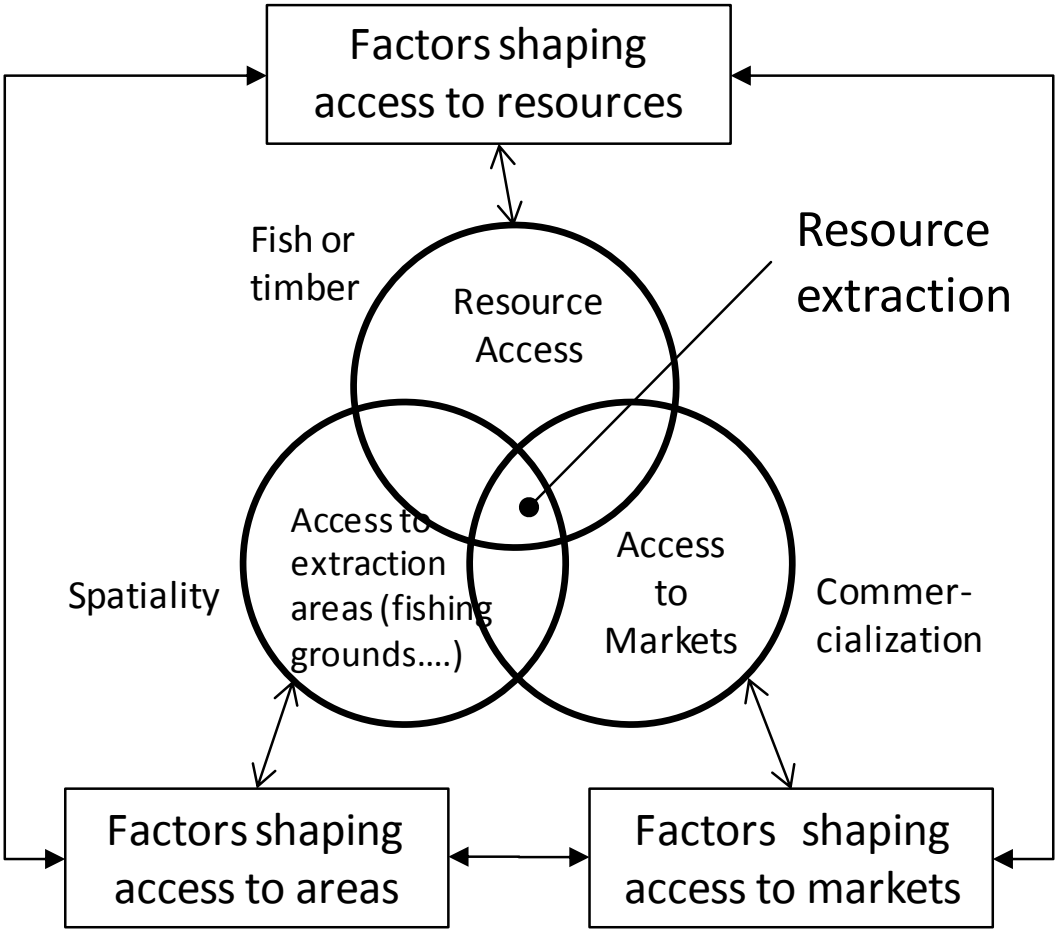
indigenous populations' social reproduction and livelihood (AIDESEP 2008; Perreault 2001, 2006; Plant and Hvalkof 2001). However, there is still little understanding of the multiple factors that shape access and the multiple levels and scales at which these factors interact to access and to manage resources (Berkes 2006; Cash et al. 2006; Ostrom 2007), especially in the context of the Amazon (Bremner and Lu 2006).

The next section addresses the need to answer what factors are shaping access to natural resources by an indigenous Amazonian population and test the hypothesis that spatial and temporal heterogeneity do shape availability of and access to fish and timber. The spatiality of access to natural resources interacts with others factors identified in this study as shaping access (Table 5.1). Hence, the conceptual model depicted in Figure 5.1 emphasizes spatiality of access by including the analysis of access to extraction areas. This model also includes access to markets, since this research focus on two commercial resources, which need the market to be sold.

Access is understood here as the ability of the people to control, claim, own, and/or use natural resources, and in addition to derive benefits from this use (Ellis 2000; Ribot and Peluso 2003). Research on access aims to understand not only who benefits from natural resources, but also through which processes people gain access to resources. In this case, this study analyzes the mechanisms through which the Kandozi gain access to fish and timber and benefit from their use at the present times (during 2009).

The following results described in this chapter are based on field work done in 2009 and based on previous work experience in the area. No particular body of literature has been used to identify the different factors, however the factors found in this study have been mentioned in other studies (Table 1.1), nonetheless they have not previously been studied integrated and by comparing two resources, as fish and timber.

Figure 5.1: Access to natural resources



Although factors that shape access are separated into access to resources, to areas and to markets (Figure 5.1), these factors are the same. All the factors that shape access to fish and timber interact among each other and vary in the way they operate at different levels and scales and at different moments over long periods of time. These factors found in this study also vary depending upon the resource in the way they operate but all the factors found in this study are shared by the fishing and forestry systems (Table 5.1). This chapter first analyzes factor by factor and then compares how they operate to facilitate access to fish and timber.

Table 5.1: Interactions among environmental factors and the factors hypothesized to shape access to timber and fish

Factors	Spatial and temporal heterogeneity
Kinship	Kin communities gain exclusive access to fishing grounds near them. People visit relatives for resources use when resources are available in a particular area.
Land Tenure and boundaries	People have access to timber depending upon the availability of the resource within the communal boundaries.
Legal frameworks	While regulations ban fishing in particular areas, the Kandozi have access to fish in other areas of their territory.
Knowledge	The knowledge the Kandozi have of their land, of technology and resources allow them to have access to resources in different seasons, areas, and to different species.

5.2. SPATIAL AND TEMPORAL ENVIRONMENTAL HETEROGENEITY

Overall, the environmental heterogeneity present at a landscape scale is an important factor that affects physical access to natural resources. The presence of diverse terrestrial and freshwater ecosystems, flooding patterns, chemical characteristics of water bodies and different seasons determine livelihood strategies of the Kandozi people. These elements will also influence ecological processes, such as fish migration and reproduction, which directly contribute to the presence and availability of fish stocks, and fishing grounds. The diversity of terrestrial ecosystems determines the physical availability (or not) of timber areas. Thus, at a more local communal level, physical access to these timber or fishing areas will allow the Kandozi people to use them and benefit from its use. This is also possible, because the Kandozi know their environment good enough to identify different habitats, species density and distribution, and other

extraction areas that they use when resources are available. Seasonality will also determine when the people will access fish and when will be able to commercialize timber. Seasonality is a inherent characteristic of rural households' livelihoods elsewhere also (Ellis 2000).

The next section describes all these processes related to environmental heterogeneity of the Kandozi territory and its relative effect on access to timber and fish. But previous to that, a section on livelihoods and its relation with heterogeneity illustrates the degree of dependence that the Kandozi have on their natural environment.

Livelihoods and environmental heterogeneity

This study of access is in relation to access to fish and timber. However, it is important to have a better understanding of how the Kandozi combine fishing and timber extraction with other activities for making a living and how the environmental heterogeneity influences these livelihood strategies. As described in Chapter two, the Kandozi territory offers diverse natural resource extraction areas for the local people's livelihood. As the Kandozi said during interviews in 2009: "nosotros no morimos de hambre, siempre hay algo que comer" ("we do not starve; there is always something to eat"). They further explained that there is always something to eat because of the different types of ecosystems they have distributed all over their territory. If they cannot find river turtle meat in swamps for example, they might be able to hunt a peccary in the terrace forest or catch fish in a small stream near a community. These alternatives are available because of landscape heterogeneity, which provides a diversity of resources that can be used.

Livelihood strategies adapt to heterogeneity

The vegetation map of the Kandozi territory obtained from WWF (CDC and WWF 2001) shows this heterogeneity (Fig. 5.2.) with nine different ecosystem types at a resolution of 30 meters. Wetlands and swamps, terrace forests, lakes and rivers are ecosystem types included in the Kandozi territory (Table 5.2). The Kandozi people recognize these differences at different scales. For example, they mentioned in 2009 that if they want to have timber areas they have to go to the upper watershed, four to seven days upstream by boat. But if they want to fish, it is better to be in the lower watershed where more lakes are located and where fish are available. When the Kandozi looked at the vegetation map that I showed them, they partially agreed with the location of vegetation types. They claimed for example that the category of riverine forest was too broad and that in fact that area includes several other types of vegetation. In addition, they agreed on the location of the aguaje palm swamp, but they argued that this swamp is not homogenous; there are areas within this category where particular species of fish use to spawn, or areas used by manatees, paiches or other fish as feeding grounds, or used as fish migration corridors. The same situation happened with the rest of the categories of the vegetation map (Figure 5.2) where they identify other habitats at a finer grain.

With this detailed knowledge of their landscape diversity, the Kandozi adapt their livelihood strategies in order to use a variety of resources that are distributed all over their territory. Furthermore, through migration mechanisms within their territory, they adapt to both temporal and physical availability of ecosystems and resources. It was common to find Kandozi people in places far from the communities where they live, looking for a particular resource. For example, communities in the lower basin as Musa Karusha used to go to Requena in the upper Chapuli River to find cedar trees for canoes.

At a more local scale, Musa Karusha people know in which wetland habitats near their community they can find resources for eating, such as parrots, other birds, or different types of fruits.

Figure 5.2: Vegetation Map of the Kandozi territory

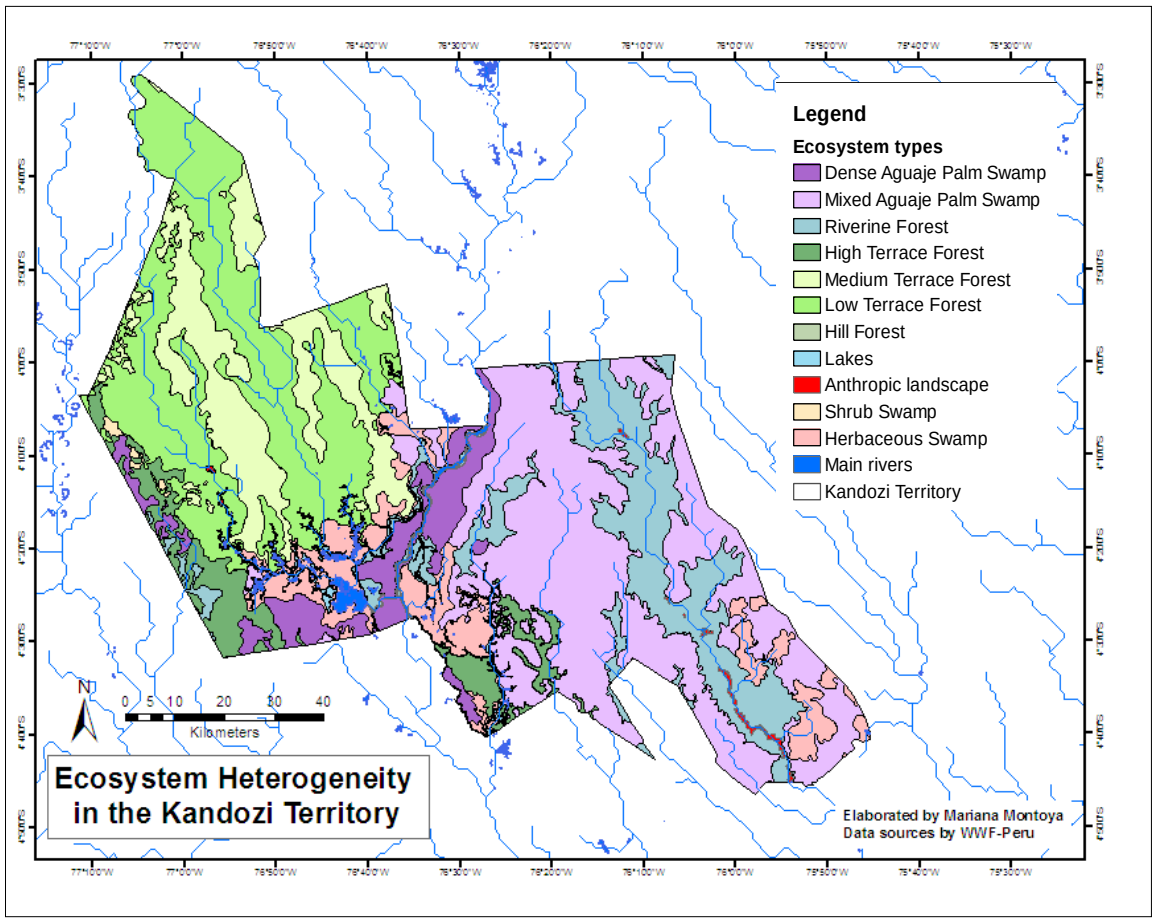


Table 5.2: Ecosystem types in the Kandozi Territory

Ecosystem Type	Area (sq. km)	Percentage (%)
Mixed Aguaje Palm Wetland “aguajal mixto”	2654.37	29.12
Medium Terraces Forest	2171.56	23.82
Riverine Forest	1247.66	13.69
Low Terraces Forest	1063.07	11.66
Herbaceus Swamp	728.53	7.99
Dense Aguaje Palm Wetland “aguajal denso”	547.31	6.00
High Terrace Forest	499.1	5.48
Lakes	136.99	1.50
Rivers	24.24	0.27
Anthropic Landscape	23.57	0.26
Shrub Swamp	19.29	0.21
Total	9115.67	100.00

Subsistence use of natural resources by the Kandozi does not appear to have changed significantly over the years, according to elderly Kandozi and comparing today's practices with accounts from the literature (Anónimo 1943; Monnier 2005; Santillana 2004; Surralles 2007). They still depend upon fishing, hunting, gathering, and extracting timber, among others.

One of the activities that did change is agriculture, as they only used to grow manioc and a few other fruits. Missionaries from the Summer Institute of Linguistics promoted the intensification of agriculture and the growth of other products during the 1950s. The Kandozi mentioned that today they have a greater variety of crops and that its consumption can be daily. They grow products such as manioc, maize, pineapple, sugar cane, sweet potato, cacao, peanuts, which have been introduced by governmental food support programs, as well as raising chickens, back in the 1990s. Therefore, they need

more area for agriculture than before. Although this implies significant change in daily life of the women, the Kandozi people in 2009 did not comment on this.

For all the activities that sustain their livelihoods, they depend upon the temporal and physical availability of the land and the resources. The Kandozi usually fish, hunt, gather and do agriculture during the entire year, and what varies is the intensity of each of those activities and the final destination of the product (subsistence or commerce). They can spend a couple of days hunting, another several days in the agricultural fields, maybe a couple of hours fishing (if for subsistence) and another couple of hours gathering, all of these on different days.

There are some seasons more appropriate than others for particular activities. The Kandozi coincided in saying during interviews in 2009 that during the flooded season it is more difficult to find fish, as elsewhere in the Amazon (Junk *et al.* 1989; Pinedo and Soria 2008; Pinedo *et al.* 2002; Smith *et al.* 2002). Fish hide in the flooded forests or swamps and in addition the lakes and rivers have more water which also hinders fishing. When the water level is low, fish are more concentrated and can be confined in lakes and small streams. Therefore it is easier to catch fish and it is possible to capture greater quantities with less efforts. But gravid fish is available when the water level is rising (see Chapter two), so this would be a good time to capture fish with eggs, which have a greater price in the market. Low water season is also suitable for agricultural tasks that cannot be done when flooded, such as planting or preparing the soil. This shows how biophysical processes shape livelihoods.

At the conditions of the height of the flood, hunting of large mammals becomes easier because animals have less dry land where they can be or hide. Flooding season is also an appropriate time to gather palm leaves for thatch because the Kandozi can enter

into an aguajal with their canoes, getting closer to palm trees. Otherwise, it would be almost impossible to enter and transport the leaves to the community. As a Kandozi said during an interview in May, when everything was flooded, “este tiempo es lindo para recoger hojas” (“this is a beautiful time to gather leaves [for thatch]”).

The time that the Kandozi dedicate to daily activities varies not only on availability, but also depends upon what they want to eat that day and the needs they have. Consequently, it is very difficult to characterize the Kandozi's frequency of daily activities because every family's food preference is different and resources availability for each community also varies. Therefore, as a Kandozi told me, when establishing communities they first look for what surrounds it, what kind of ecosystems they have available and then consider what their preferences are. This demonstrates not only the spatiality of resource use, but also how the Kandozi have to adapt to their changing environment and the flexibility of their activities for providing livelihoods.

They said during interviews that they will also look for food depending upon what the wife feels like eating: “nos aburrimos de comer siempre lo mismo, asi que buscamos lo que se le antoja a la mujer” (“we get bored if we eat the same, therefore we will find what the woman wants to eat”). The woman is the one who tells her husband what kind of food (a particular species of fish, turtle eggs, and palm hearts, among others) she wants to eat. Her food request will depend not only on what she wants to eat, but also on the children's ages. Kandozi women for example, explained during conversations that infants cannot eat fish because it causes them diarrhea. Women can ask for variety because they know the territory provides different options for food.

The role of the Kandozi children in livelihood strategies

Drawing from observations done during field work in 2009 and previous visits to

the area, I would argue that Kandozi children are an important labor force, especially girls older than six years. Young girls not only take care of younger children, but they also have to cook or at least feed their younger siblings with fruits or manioc drink (Illustration 3). When parents spend an entire day outside the community, children go together to gather fruits such as coconuts, papayas, cocona, oranges, among others, or they can also fish in the flooded forest or in small lakes near the community. Nevertheless, this possibility of children for acquiring enough food for them is not everywhere. Food availability depends upon community location. Children can have very different food supply if they live in different communities, since they will be not able to go far away from their place without adults. Here again, a heterogeneous landscape will determine how much access children have to resources.

Seasonality and environmental dynamics also influence if children have access to resources or not. In some communities small ponds are formed due to flooding, which create habitats for fish that can be captured without leaving the community (Illustration 9). For example, in Nueva Union community in May 2009 young children (between 4 and 7 years approximately) were capturing small fish with nets in the flooded area of the community (where a temporary pond was formed). Later, these same children were eating fish captured from the pond. In addition, young boys from Nueva Union were fishing for larger fish in the lake that surrounds the community and, another group of children was gathering fruits in the forest. I also went with a group of young boys to catch fish in the flooded forest (Illustration 10), called by them "tahuampa" and to collect fish eggs that were laid on the leaves (Illustration 11). Children eat the fish eggs directly from the leaves.

Illustration 9: Children fishing in the community of Nueva Union

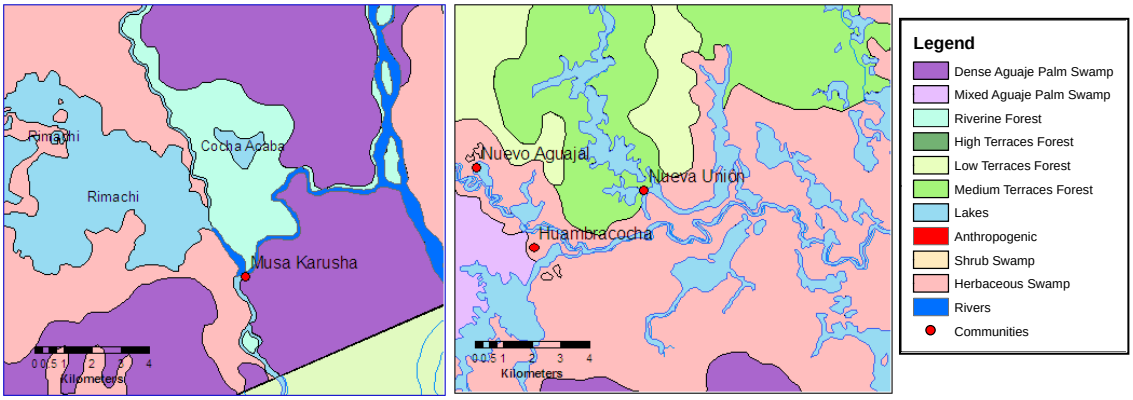
Illustration 10: Children in the flooded forest “tahuampa” capturing small fish

Illustration 11: Leaves with fish eggs collected by Kandozi children for food

Illustration 12: Musa Karusha community flooded in May 2009

All of this was possible without their parents because this community has fruit trees, and it is set close to a small lake adjacent to an aguaje palm forest. The different ecosystem types allowed this community to have access to a variety of resources close by (Figure 5.3). A very different situation happened during the same time in the Musa Karusha community. Children there had to eat plantains and manioc only, because they did not have such a variety of resources available. As shown in Figure 5.3, Musa Karusha is surrounded primarily by wetlands. Plantains and manioc were collected by adults far from Musa, where there is still non-flooded land, or were brought to Musa from another community. In addition, the Pastaza River that runs by Musa Karusha is too dangerous for a young child to try to fish in a canoe. So, these children had a very different food supply due to community location.

Figure 5.3: Vegetation differences between communities



Migration as a mechanism of adaptation to the environment

Not only is the children's food supply affected by community location and environmental dynamics, but also by social dynamics, especially internal migration for food supplies. In May 2009 when the water level was high (Illustration 12), most of the families from Musa Karusha had to leave the community. They had to visit relatives for

an uncertain period of time, because they had scarce food supplies and they did not have a dry place to make fire for cooking. Adults can walk longer distances to find food or can cross the Pastaza River to fish in the lake Rimachi. But they said that it is too much work to get only few fish or small amounts of manioc under these conditions. Banana plants could not resist these conditions either and were all dead. It was easier for Musa Karusha inhabitants to move to another community until the water level decreases.

Effects of spatial heterogeneity on access to fish and timber

Uneven physical availability of resources

At a local-communal level, spatial heterogeneity creates an uneven physical availability of resources especially between communities in the headwaters of the Chapuli and Chuinda rivers compared to communities closer to Lake Rimachi and the flooded portion of the Kandozi territory. In fact, community establishment responds partially to this spatiality and to the type of habitats and resources that will surround the future community, according to Kandozi answers during informal interviews.

The Shannon landscape diversity index calculated for 35 communities (Table 5.3) shows a maximum diversity of 1.7122 with a mean of 0.738816 and a Standard Deviation of 0.5426292. The Shannon index was calculated in a circular area of 8 kilometers of diameter where the center is the community and that represents an average of daily disctance travled for food. Communities in the lower portions of the rivers and especially in the Chapuli River exhibit the highest indexes of landscape diversity in the circular area that surrounds the community (4 kilometer of radius from the community).

Furthermore, when vegetation types were grouped into fishing grounds and non-flooded areas, communities in the lower watershed such as Musa, Nuevo Union, and

Huambracocha have the largest areas (percentages in Table 5.3) of fishing grounds. Communities in the headwaters of the basin on the contrary have larger areas of forest. Limoncocha, Nuevo Limon and Nuevo Samaria have 100% of forest and those communities are located in the most upper section of the Chapuli River.

Table 5.3: Area of fishing grounds, non-flooded areas and diversity per community

Kandozi Community	Fishing ground (%)	Non-flooded area (%)	Landscape Diversity (Shannon index)
Capirona	0.00	99.98	0.5698836
Caspacocha	2.55	96.16	0.4650230
Charapacocha	48.86	51.14	1.0810170
Chuindacocha	2.92	95.79	0.4668996
Domingococha	37.22	62.78	1.6707504
Hifco	4.41	94.30	0.4154133
Huambracocha	79.02	20.98	1.4854670
Ihuaquicocha	1.04	95.44	0.5667442
Limoncocha	0.00	100.00	0.0697244
Musa Karusha	81.91	15.54	1.2714919
Nuevo Caimito	0.00	99.99	1.7121888
Nueva Alegria	43.80	56.20	1.4049185
Nuevo Aguajal	44.90	55.10	1.2983854
Nuevo America	1.23	95.11	0.4190306
Nuevo Belen	25.64	74.36	0.5391574
Nuevo Chingana	23.62	76.38	1.5383368
Nuevo Egipto	0.00	99.46	0.4078195
Nuevo Huambracocha	3.36	96.64	0.9528344
Nuevo Limoncocha	0.00	100.00	0.3661822
Nuevo Samaria	0.00	100.00	0.0660635
Nuevo Union	64.28	35.72	1.6513421
Nuevo Yarina	3.21	95.50	1.7036020
Puerto Angara	41.85	58.15	0.4744775
Puerto Barranquillo	0.00	96.48	1.1719639
Puerto Belen	15.27	84.73	0.5403836
Puerto Chingana	14.05	85.95	0.0000000
Puerto Mayna	0.00	100.00	0.5151690

Puerto Pirumba	7.19	92.81	0.0403978
Puerto Requena	0.00	100.00	0.4039929
Puerto Tangana	0.00	96.48	0.3862295
Puerto Unguri	0.00	100.00	0.2754223
Puerto Wichi	1.64	98.36	0.0000000
San Ramon	1.36	94.39	0.5818773
Tapashicocha	0.05	99.94	0.7688388
Zumbachicocha	9.42	90.58	0.5775406

Drawing from the analysis of the vegetation map, despite the broad resolution used to identify vegetation categories, it can be said that there is an evident difference in what resources each community has available. Access to resources by each community will be influenced by the habitats that surround each one.

Access to resource extraction areas: fishing grounds and timber areas

The Chapuli River. The Kandozi people argue that there are important reasons why more than the 60% of the Kandozi population lives in the Chapuli area: "aquí hay más alturas y lindas cochas para pescar" ("here are more up lands and beautiful lakes to fish in"). In practical terms this means they have a greater variety of options that they can access. The Chapuli basin is the most populated in the Kandozi territory. Thirty of the forty communities (based on 2009 data) are located along the Chapuli River (Table 3.1 in chapter 3).

Puerto Barranquito and Nueva Yarina for example are two of the oldest communities in the Chapuli basin. They were established between the 1960s and 1970s. Both community leaders claim to have today enough up lands (non-flooded) for the people to settled, to install agricultural fields (called *chacras*), and that are close to hunting areas. Those were some of the reasons why these communities were established where they are at present. The people of these communities though, have to go to the Rimachi area or to Lake Casho to fish, since they do not have lakes close to them in

which they can fish for commercial volumes. Contrarily, the majority of the communities located on the lower part of the Chapuli basin have a lake in the vicinity, and hence ease of access for fishing.

At present, several of the small lakes in the lower part of the Chapuli basin have been self-designated as being property of a particular community or of a group of communities with some relationship among them (Table 5.4). These designations have been decisions made by each community or group of communities and today are tacitly accepted by the rest.

Table 5.4: Fishing areas of the Kandozi communities of the Chapuli River

Lake	Communities that control the lake
Zúngarococha	Tapachi cocha
Marcacocha	Zumbachi cocha
Anjira	Puerto Belén, Zumbachi cocha, Ihuaquicocha y Barranquillo. The last two communities only when they need fish for celebrations.
Ururo	Puerto Belén
Chuindacocha	Chuinda cocha, Nuevo Belén
Aguajal	Aguajal
Llerchi	Huambracocha
Anguilla	Huambracocha
Huambracocha	Huambracocha
Llerchi	Nuevo Huambracocha
Anguilla	Nuevo Huambracocha
Unión	Nuevo Unión
Tariri	Nuevo Unión, Huambracocha, Nuevo Huambracocha
Belisho	Huambracocha, Nuevo Huambracocha
Casho	All of the communities in the Chapuli. From this lake to the Lake

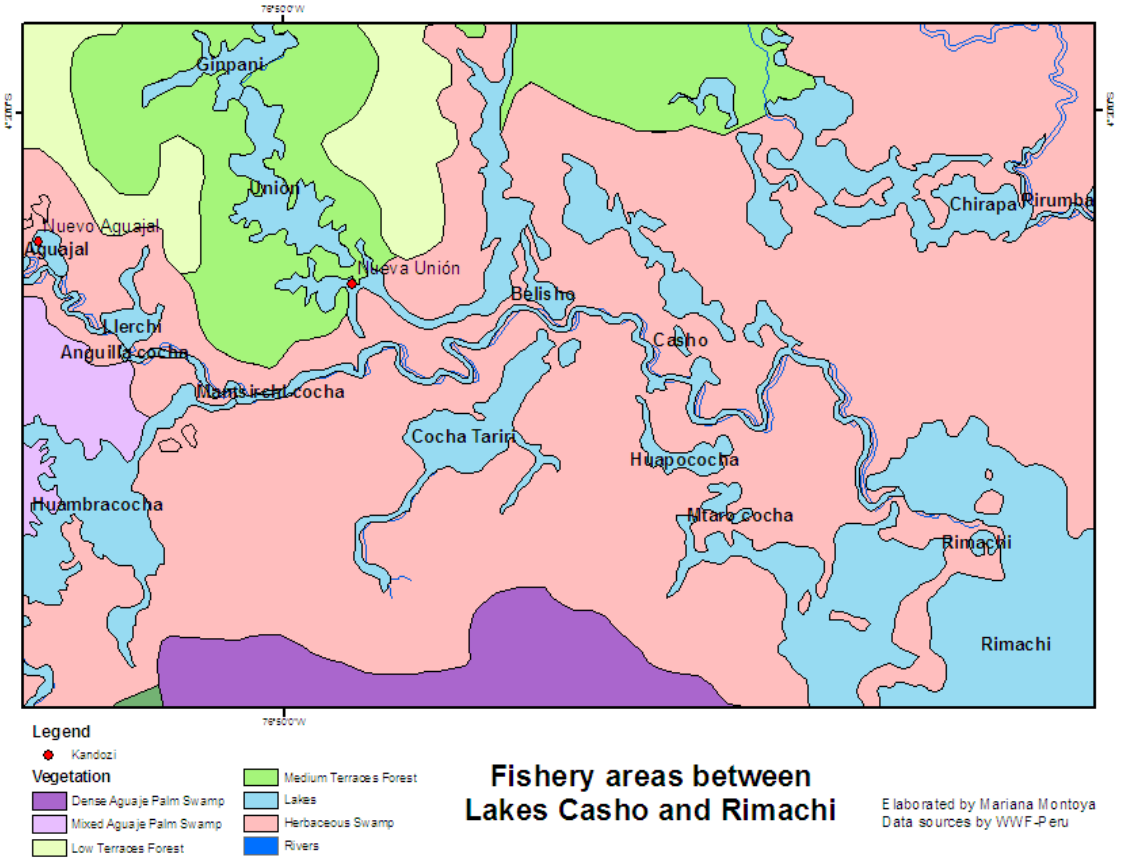
	Rimachi, all of the other lakes are open access to the communities of the Chapuli.
Huapococha	All of the communities in the Chapuli
Mtaro	All of the communities in the Chapuli

Source: Apu from Ihuaquicocha and President of the artisanal fishing association Yungani.

Access institutions have determined three different levels of access to fishing grounds. In the Chapuli River for example, some communities have more than one place to fish, and sometimes this place is shared with one or more communities (Table 5.4). But in other cases such as Nueva Union community, Lake Union is for their exclusive use. Lakes between Lake Casho and the Rimachi (Figure 5.4) are of free access for communities of the Chapuli. However, communities of the Chuinda and Pirumba Rivers cannot fish in these lakes without permission from people of the Chapuli River. Chapuli communities claim at present to have the right to fish in these lakes because they have always used them and because they live near to them. Taking care of the lake means that they do not allow mestizos fish in there, they do not use toxic plants, they do not catch fish with eggs, and they fish amounts that will not affect the stocks.

The varying levels of access to fishing grounds have been changing over time and will be further discussed in Chapter seven. Proximity from communities to these areas for several years has contributed to this evolution of access. Other factors as kinship are also relevant and will be explain more fully later in this chapter.

Figure 5.4: Lakes below Casho



The same situation occurs with hunting and timber areas. Communities of the Chapuli River share among themselves hunting trails and areas where they can cut trees for canoes or building. However, the people from the Chapuli will not share these areas with communities from the other two rivers, unless those people ask for and get permission. Communities in the Chapuli River have an advantageous situation because of their location. Due to their proximity to lakes, they have claimed exclusive access to them. This is in relation to the spatiality of access. Furthermore, these communities also have non-flooded areas near them where they can hunt, do timber extraction and agriculture and do not share with communities from other rivers. For example,

communities such as Nuevo Alegría, Puerto Angara, Domingo cocha and Nuevo Belén have nearby terrace forests where they share the Guri trail to hunt and to collect trees, fibers and fruits.

In conversations with them, the Kandozi people emphasized their advantageous situation when they are located in the lower portion of the Chapuli River, because in less than two hours travel they have enough fish, game and other products to fulfill their basic needs. On the contrary, people from communities in the upper parts of the basin, such as in Nuevo Limon complained that although they have larger amounts of land to cultivate and hunt game, they had to spend at least a week in order to bring fish to their community. But at least, Nuevo Limon has access to fishing grounds in the mouth of the Chapuli. Thus, location of the communities will determine the amount of time they invest in different activities and will also influence their livelihood strategies.

The Chuinda River. Communities from this river feel that at present every community wants to have an exclusive area for fishing or timber extraction. “En tiempo pasado no era así” (it was not like that in the past). Thus if a community is not near a lake or does not have a forest area nearby, it is in a disadvantageous situation, because it will have more restricted access to resources, or resources will be not available at a close distance.

The smallest number of communities is in the Chuinda basin. There are only four communities located along the Chuinda River (Table 3.1), widely separated from each other. These communities also have self-assigned exclusive access to fishing, timber and hunting areas. Puerto Unguri and Puerto Requena, two communities located on the upper part of the Chuinda River go down the river to fish in Chirapa Lake. Requena people claimed that this area is theirs and therefore they exclude others from fishing there.

“Nosotros mezquinamos la pesca en cocha Chirapa a otras comunidades, sólo los de Unguri pueden venir” (“we are reluctant to share with other communities fishing in the lake Chirapa; only people from Unguri can come”). They said that before they had the title they did not exclude anybody, but after they got titled, they did. (Further discussion on titling is later in this chapter). They feel that the situation with access to resource use areas have become worse after titling. This shows how access has changed from an open access system to a system regulated by different access institutions. In addition, Requena claimed Lake Chirapa due to proximity. In this case, another factor such as land tenure has also shape access to a fishing ground.

Due to location in the headwaters, Puerto Requena and Puerto Unguri do have important timber areas within their communal limits. Therefore, according to internal rules, they “own” these areas and each community has exclusive access to the trees from those areas. They are not even willing to share trees for canoes with other Kandozi people, since their notion of property of the resources within its community title has become very strong, in particular in Puerto Requena. Thus, Puerto Unguri and Puerto Requena have secured access to timber, not only because they are surrounded by non-flooded forest and because timber is physically available within their communal land, but also because they have excluded others from having access to these timber areas.

Kandozi communities on the Chuinda River also have hunting trails near them. Some of these trails reach the Pirumba River. Specifically, Puerto Requena can communicate with Puerto Chingana and Puerto Wichi from the Pirumba River, by walking through hunting trails that are shared among these communities. Because Puerto Requena and other communities are located in the terrace forest, they claim also to still have animals that are commonly hunted. However, since animals move widely, Puerto

Requena or any other community cannot claim ownership of game, only of trees within their boundaries. So the nature of the resource also determines if access is exclusive or not. The Kandozi people do not have quotas for game. When they go hunting, they can kill as many animals as they need and they will own the animal that they have killed. They can share the meat if they want to, but they are not obligated to do so. Even if people go together for hunting, the person who actually killed the animal (the hunter) is the owner of it. It is not shared among the group of people that went hunting.

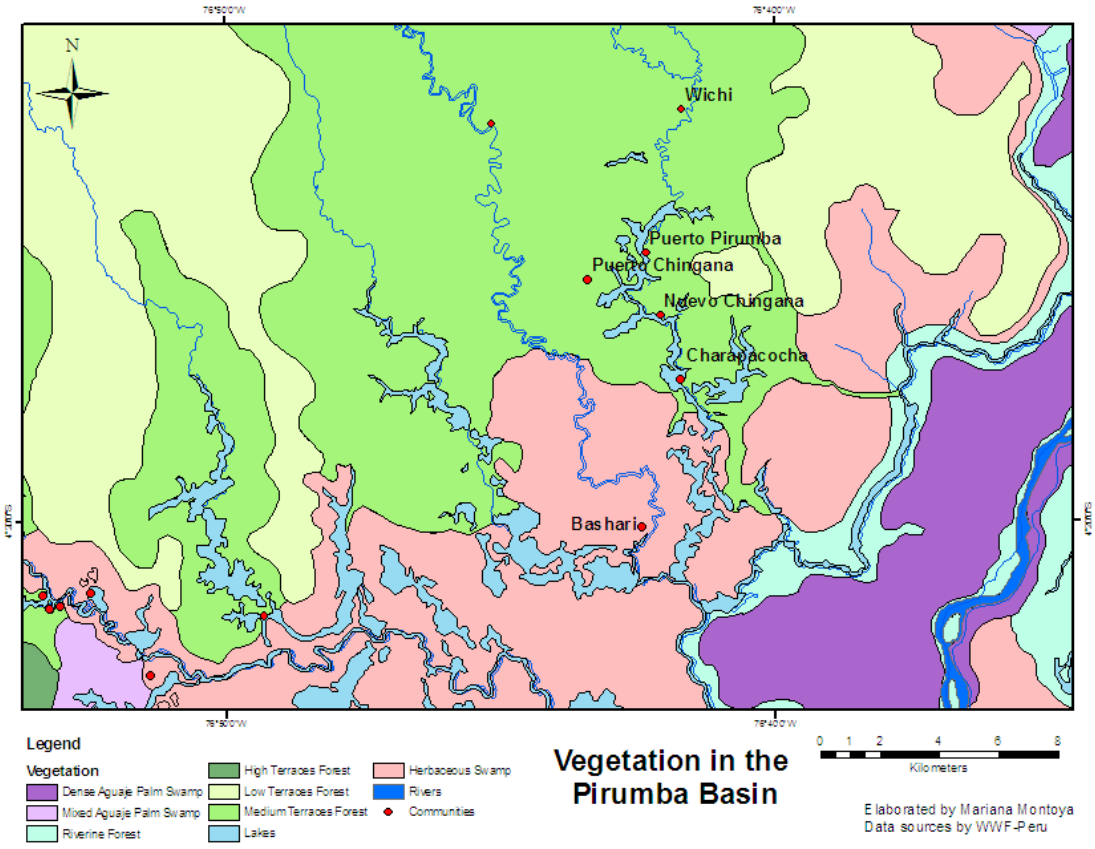
Puerto Requena people argue that their location favors the settlement of more people there. They have large areas for hunting, gathering and timber within walking distance. In addition they have a large freshwater area called Chirapa, where they have great amounts of fish for their exclusive use. They do not need to go far away to bring home peccaries, monkeys, big birds and other game for their consumption.

The Pirumba River. The Pirumba basin is in fact, a system of different lakes that are connected by small streams or by the Pirumba River. Consequently, it is not difficult for communities living there to exclude others from the area. Control of this area does not demand too much effort because there are few entrances to the area. Likewise, the Huangana River, which is considered part of the Pirumba system, is near to communities in Pirumba, which makes it easier for communities to control access to this river and its surrounding aguaje palm swamp system.

The five communities in the Pirumba basin are located in a large area of swamps, aguaje palm forests and lakes, but also with the presence of terrace forests (Figure 5.5). These characteristics offer the people in this area (Table 3.1) fish, game and timber areas that can be used. These five communities have gained exclusive access to Huangana, Tapaje and Pirumba lakes for fishing over the years. Puerto Chingana is one of the oldest

communities in the entire Kandozi territory that was established and they used to fulfill their needs from this area. So, as in the case of Requena, they have claimed the Pirumba areas as theirs. Lakes within the Pirumba basin are shared among the five communities but not with communities from other rivers. Therefore if non-Pirumba communities want to fish in there, they have to ask for permission.

Figure 5.5: Vegetation of Pirumba basin



This area is an interconnected system of lakes, hence suitable areas for agriculture are present, but not necessarily in each community. Communities such as Charapacocha have some agricultural plots in the same place, but other plots are along the Pirumba River, so it takes more time to go there and work in the fields. This is compensated with

fishing activities, which can be done in the same community or in any other lake that is near all of the communities. Furthermore, fishing areas such as Huangana, which are influenced by the waters of the Pastaza River, are highly productive areas that provide abundant fish for the Pirumba communities. Consequently, fish is physically available for these five communities.

Timber areas are also present. However the residents mentioned during interviews that these were far from communities. Due to entanglement of the interconnected lake system, timber areas are difficult to reach, and also transportation of cut timber is complicated. Physical availability of timber in this case is more restricted than in the Chuinda River.

Decisions regarding income generating activities

As seen in previous sections, the great variety of land and freshwater resources not only offers means for subsistence, but also serves as a source of monetary income for the Kandozi. These physical differences, together with rules of access, have an effect on what areas and resources the Kandozi can access in order to perform activities to generate monetary income. This result supports other studies (Pyhälä *et al.* 2006) near the Iquitos area, where physical availability of resources is also one key factor determining access to resources and its benefits.

A survey done in September 2007 (García Hierro et al. 2008) in which researchers asked in Kandozi communities about their primary source of income shows how fish, timber and game are the main economic source of income for all of the Kandozi community. The sale of turtle eggs became the second most important source of income. Livelihood strategies are more diversified when it comes to the third most important source of income. Other products appeared in the list such as chickens and plantains

(Table 5.5). This information was asked only once by a group of researchers (García Hierro et al. 2008) during workshops in each community. During workshops, community members agreed on the answers to all the questions, including the one about income sources. Therefore the main source of income assigned to each community is not an average of each person's income. It is an agreement of all the community members that participated in the workshop.

Table 5.5: Economic options for Kandozi communities

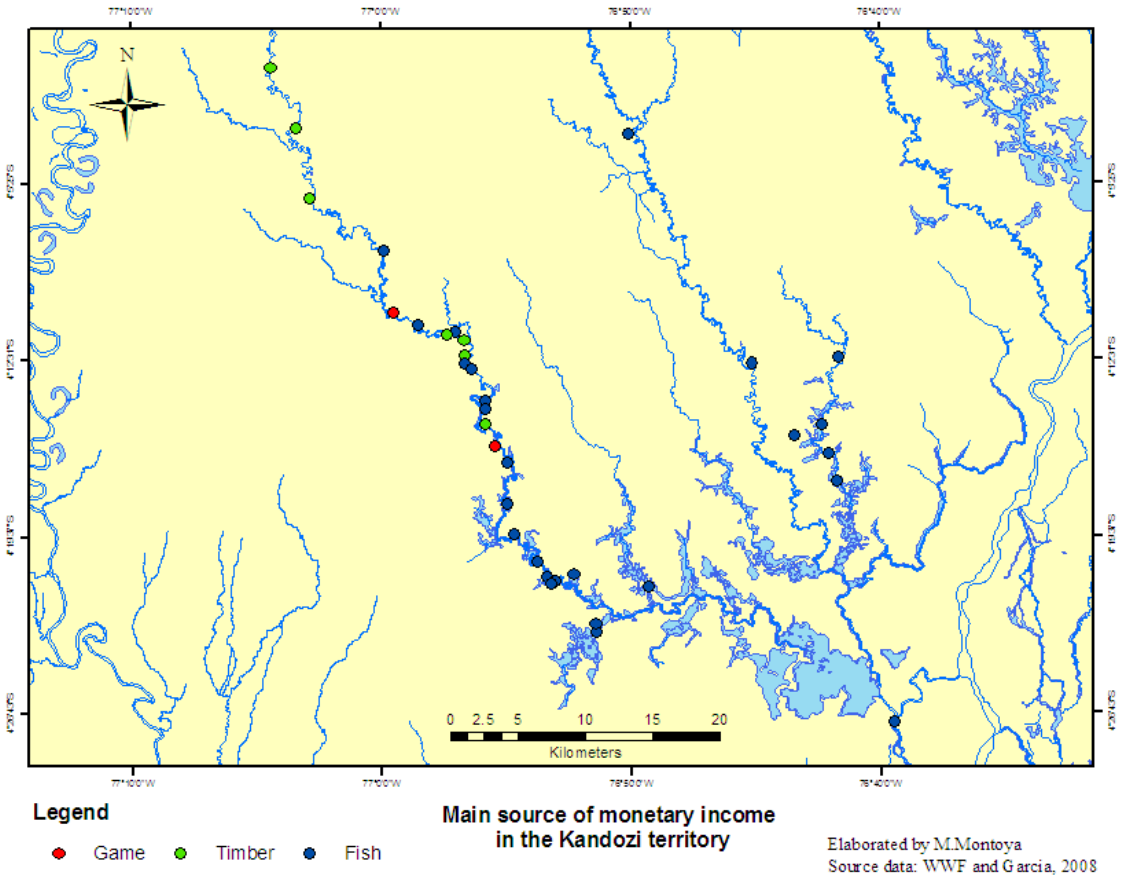
Community	**First source of income**	**Second source of income**	**Third source of income**
1. Capirona	Timber	Fish	Meat
2. Caspa Cocha	Fish	Meat	Banana
3. Chuinda Cocha	Fish	Meat	Timber
4. Domingo Cocha	Fish	Turtle eggs	
5. Hifco	Meat	Fish	Timber
6. Huambra Cocha	Fish	Turtle eggs	Meat
7. Ihuaqui Cocha	Timber	Fish	Meat
8. Limón Cocha	Timber	Meat	Fish
9. Nueva Alegría	Fish	Meat	Turtle eggs
10.Nueva Huambra Cocha	Fish	Meat	Turtle eggs
11.Nueva Unión	Fish	Turtle eggs	Meat
12.Nueva Yarina	Timber	Fish	Meat
13.Nuevo América	Fish	Meat	Timber
14.Nuevo Belén	Fish	Turtle eggs	Meat

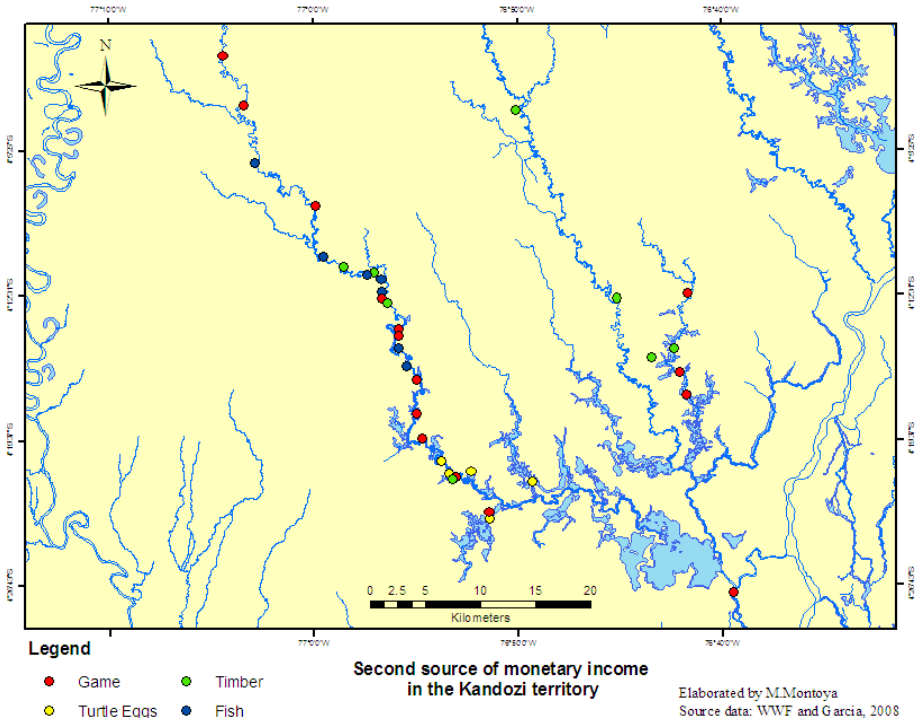
15.Nuevo Caimito	Fish	Timber	Meat
16.Nuevo Egipto	Meat	Fish	Timber
17.Nuevo Limón Cocha	Timber	Meat	
18.Puerto Aguajal	Fish	Turtle eggs	Meat
19.Puerto Angara	Fish	Timber	Meat
20.Puerto Barranquillo	Fish	Timber	Meat
21.Puerto Belén	Fish	Meat	Banana
22.Puerto Mayna	Fish	Meat	Timber
23.Puerto Tangama	Timber	Fish	Meat
24.Samaria	Timber	Fish	Meat
25.San Ramón	Fish	Timber	Meat
26.Sumbachi Cocha	Fish	Meat	Timber
27.Tapashi Cocha	Fish	Meat	Chicken
28.Puerto Requena	Fish	Timber	
29.Puerto Unguri	Fish	Timber	Meat
30.Charapa Cocha	Fish	Meat	Timber
31.Nuevo Chingana	Fish	Meat	Timber
32.Puerto Chingana	Fish	Timber	Meat
33.Puerto Pirumba	Fish	Timber	Turtle eggs
34.Puerto Wichi	Fish	Meat	Turtle eggs
35.Musakarusha	Fish	Meat	Timber

In 2007, September corresponded to a fishing month, because the level of the water was low. It is probable that if the same question about source of income would be

asked in another time of the year or in a different year, it would have different answers. However, they are still valid to show what people did for cash income in September 2007, in this case during the fishing season. With this limitation taken into account, maps were created for this research using those data (Figure 5.6) in order to visualize them and see if they exhibit a geographical pattern or if they could help understanding how environmental heterogeneity shapes access to resources that are and income generation sources. Figure 5.7 provides an example of the different sources for a community.

Figure 5.6: Main sources of monetary income for Kandozi communities

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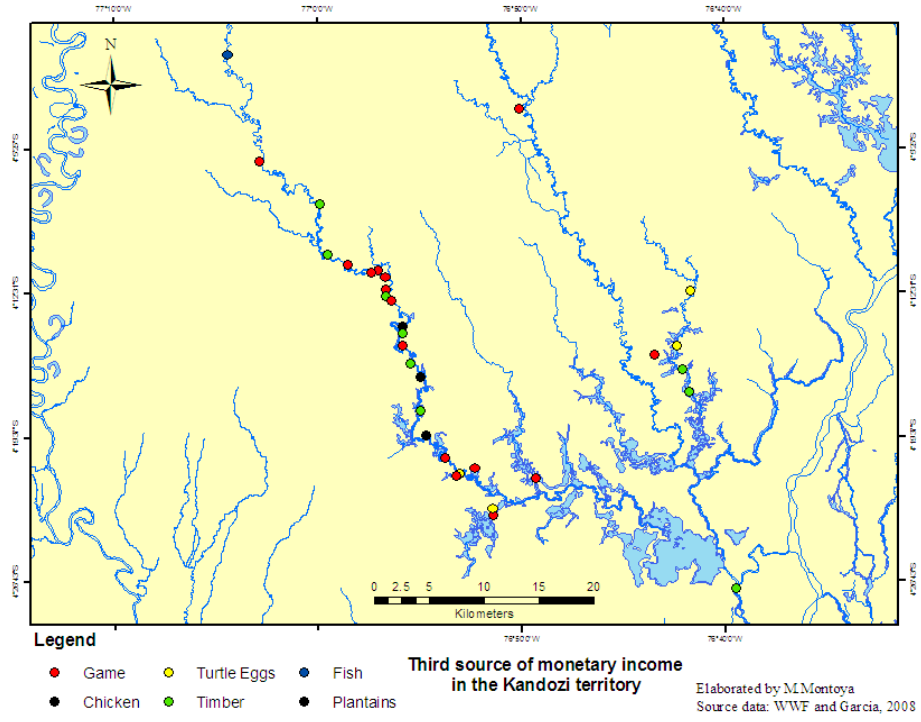
N
0 2.5 5 10 15 20
Kilometers
Legend
Game
Timber
Turtle Eggs
Fish
Second source of monetary income
in the Kandozi territory
Elaborated by M.Montoya
Source data: WWF and Garcia, 2008


77°10'0"W
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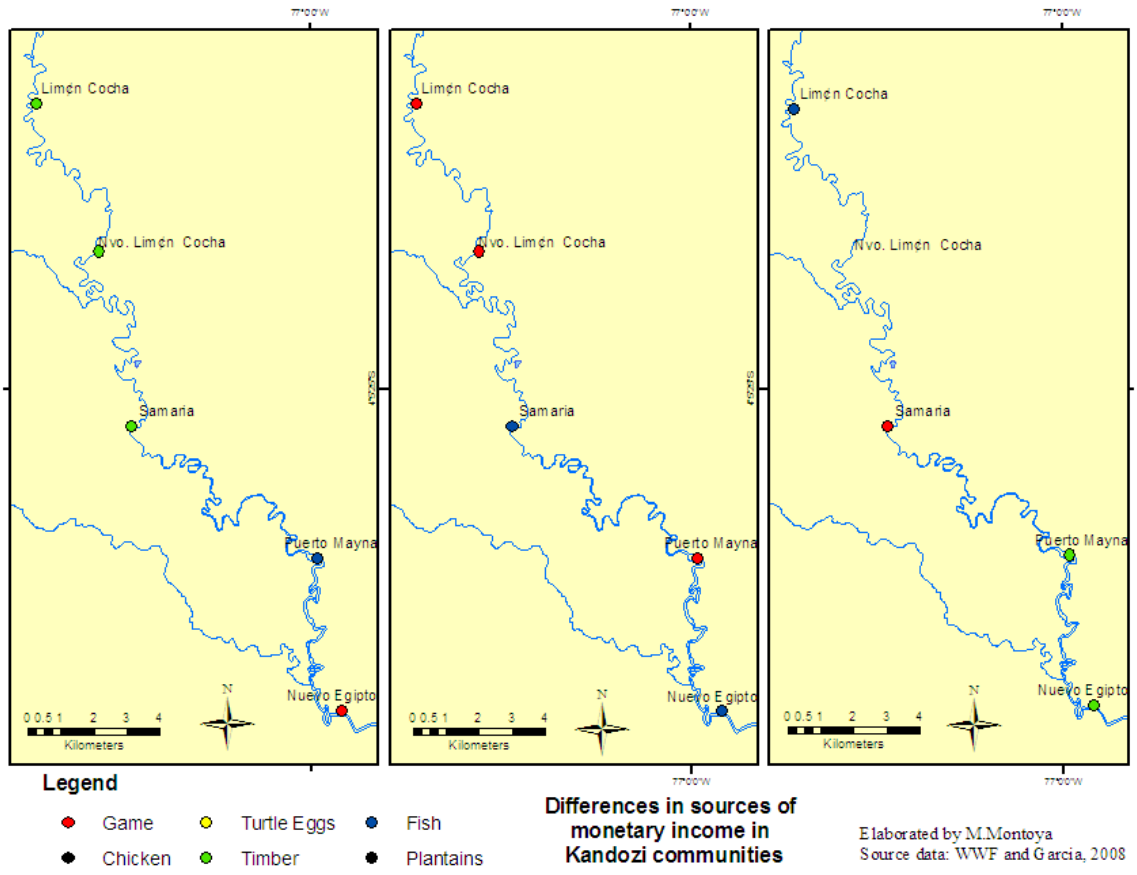
Kilometers
Legend
Game
Turtle Eggs
Fish
Chicken
Timber
Plantains
Third source of monetary income
in the Kandozi territory
Elaborated by M.Montoya
Source data: WWF and Garcia, 2008

Figure 5.7: Sources of monetary income in Samaria, Chapuli River



These data were also explored for this research using the SPlus software to create tree models. For this exploratory analysis, additional variables were created and incorporated (see the methods chapter) into the tree models. Results from the maps and tree models are similar. Both show how economic alternatives may be related to location. It is important to mention though, that this claim is not conclusive. It is only describing the particular situation in 2007.

These maps help to visualize differences between communities from the Chapuli River and the Chuinda and Pirumba Rivers. In the Chapuli River, the three most northerly

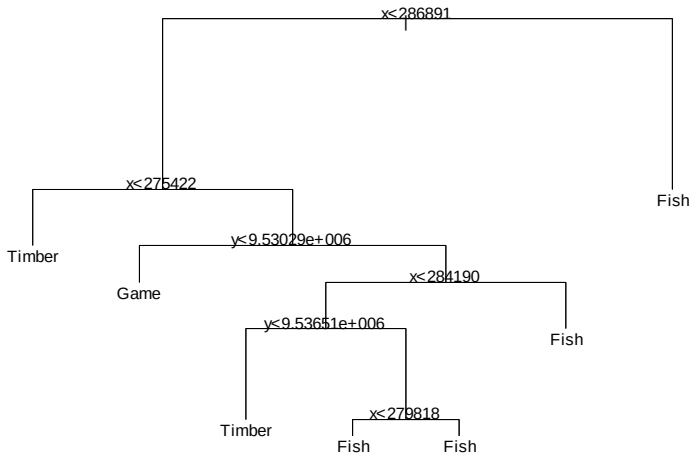
communities did timber extraction as their main source of income. While in the other two areas, all communities relied on fishing as a main economic activity in September 2007. One of the reasons these three communities from the Chapuli chose to extract timber as a main activity may be proximity and accessibility to the forest and the long distance to fishing grounds, as happens in areas near Iquitos (Pyhälä *et al.* 2006). However, these maps only represent the economic activity in September, thus Kandozi communities can use other resources in a different time of the year as a mechanism to obtain income from it, and their main activity can change over time.

Tree maps incorporated other variables in the exploratory analysis. Created categorical variables such as "land tenure" and "access to fishing grounds" were incorporated in the analysis, as well as the different types of vegetation surrounding each community and the Shannon index of landscape diversity. The model with minimum residual mean deviance (0.198) was the one that incorporated only coordinates (Figure 5.8). This means that although for constructing the trees other variables were used, only location explained the variability of the classification. The classification tree that used location, diversity of landscape, land tenure, access and distance to fishing grounds as variables for constructing the tree, resulted in a model with 0.4708 of residual mean variance. This model incorporated coordinates and diversity only for explaining variability (Figure 5.8).

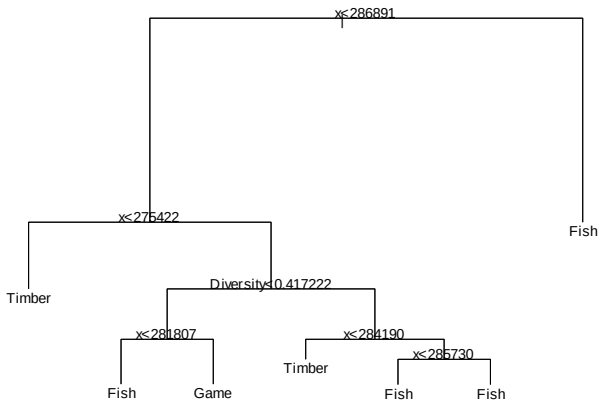
Location appears to be an important factor determining the economic activity of the community at least for September 2007. However, location is in relation to landscape diversity, accessibility, and distance to resource extraction areas among others. But in addition to location, there are other factors such as preferences, the presence of the logger, rules of access that determine exclusive access to fishing and timber areas, etc.

These maps help to visualize the spatiality of resource access and supports findings in the Iquitos area (Pyhälä *et al.* 2006). But although the maps and tree model show geographical pattern due to the relevance of location, there are several other factors that influence decisions regarding economic activity.

Figure 5.8: Regression tree maps



Classification tree: Coordinates X Y and vegetation variables
Number of terminal nodes: 7
Residual mean deviance: **0.198** = 5.545 / 28
Misclassification error rate: 0.05714 = 2 / 35



Classification tree: Coordinates X Y and Diversity, Access, Land Tenure and distance to fishing areas
Number of terminal nodes: 7
Residual mean deviance: **0.4708** = 13.18 / 28
Misclassification error rate: 0.1143 = 4 / 35

Landscape and local scale spatial heterogeneity affects directly whether a resource is physically available to the Kandozi people. The heterogeneous matrix with patches of lakes, different types of swamps and terrestrial ecosystems, influences where the people establish a new community. This location is critical, according to rules of access, in regards of what fishing ground or what timber area each community has access to.

Effects of temporal environmental heterogeneity on access to fish and timber

To perform commercial activities such as fishing and timber extraction and to benefit from them, resources need to be available, not only physically but also it has to be at the right time. The next section explains how temporal heterogeneity also has an effect on access to resources not only by making them available, but also by providing the conditions to perform the activity.

Access to commercial fishing

Fishing grounds. An area has to have several characteristics to be considered a commercial fishing ground, according to the Kandozi people. Not only is the abundance of fish important in order to reduce fishing efforts, but also the presence of fish species of commercial value. Depending upon the area, Kandozi fishermen will be able to find fish species that are valuable in the market with different prices. Some species such as boquichico, fasaco and other small fish are distributed widely in the different lakes near Lake Rimachi. But other species, such as gamitana, paiche and arahuana, have more specific areas where they can be located according to Kandozi fishermen. Another important characteristic of fishing grounds are the beaches formed during low water level season, where the Kandozi establish seasonal fishing campgrounds (Figure 5.9).

Sand beaches are formed in the vicinity of Lake Rimachi, in the south portion of both the Chapuli and Chuinda rivers and in the Huangana River (Figure 5.9). Therefore, Kandozi fishermen travel from their communities to these areas in order to install fishing camps on those beaches and stay there during the fishing season. The Kandozi man with his family has to find a good place to install a small house (basically only a thatch roof) and a place to make fire (Illustration 13). Fishing camps are necessary because fishing areas are far away from communities and it can take days to complete the harvest of the amount of fish they need.

People from Nuevo Limon for example, can take four days to go to Lake Rimachi to fish, and can take longer on their way back because they have to go upstream. With so much time invested in the trip to the fishing campground, people from Nuevo Limon will spend several days or weeks there, before they can go back to their community. Even for communities closer to campgrounds is better to stay there during the fishing season

because they do not invest time, effort and money (for fuel) to go back and forth from fishing camps to the community. Besides, if they want to contact mestizos that will buy their fish, they have to be closer to the Rimachi or Musa Karusha where all the mestizos go to buy fish. Hence, the emergence of sand beaches is a determinant for the Kandozi to have access to commercial fishing and to mechanisms to sell the fish and obtain income.

Illustration 13: Fishing camp in Lake Rimachi, January 2006

The fishing season for the Kandozi can vary from one week to one or two months at the most, depending upon the presence of fishing campgrounds (sand beaches) and availability of fish. Both, campgrounds and fish availability are contingent on the water level. If it is too flooded, fish will hide and the Kandozi will not have a site to establish their fishing camps. The length of commercial fishing activities also hinges on the

amount of fish the Kandozi need to capture to fulfill his demands, which varies from one Kandozi to another.

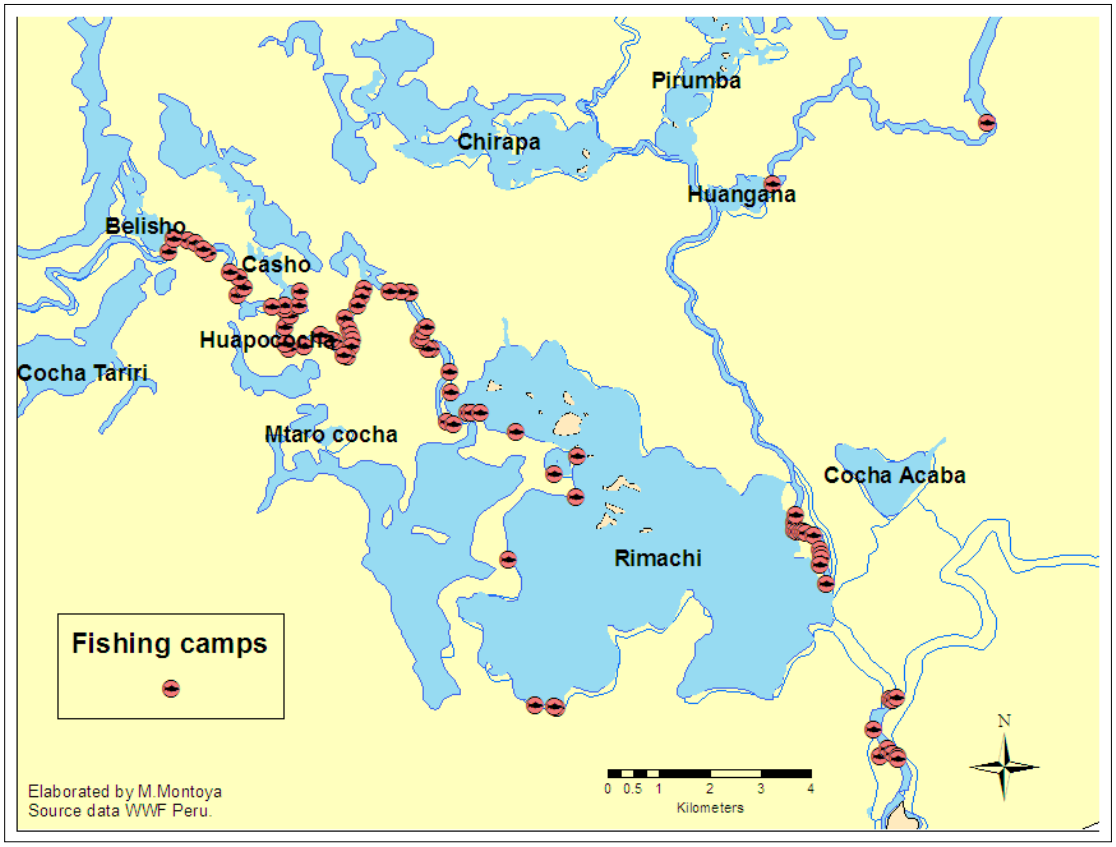
Kandozi women are the ones who decide the suitability of the fishing camps, when the water level starts rising and the campground starts flooding, hence making it impossible to cook or live there. At that moment, the wife decides either to move to another fishing campground or to go back to her community. In 2009, the water level was so high that the Kandozi did not have a fishing season in January and February as was expected, because beaches never appeared (Illustration 14). Every Kandozi who was asked about this, complained about the lack of a "vaciante" (low water level). Estimations of the water level variation done in May 2009 in camps areas in the Chuinda River were of 1.5 meter approximately. Therefore, the majority of the Kandozi were not able to have commercial fishing activity during January and February 2009 as usual. They lost the possibility of having access to a monetary income from fishing until October, when the water finally dropped enough for beaches to appear (Kandozi leader, personal communication). This dependence of commercial fishing grounds upon water level and flooding patterns determines whether the Kandozi will be able to have access to commercial volumes of fish or not.

Most of the communities choose to fish close to Lake Rimachi in order to harvest commercial volumes and economically valuable fish species. Nevertheless, there are some arrangements among communities from the three rivers in regards where they install fishing camps. All of the communities interviewed from the Chapuli River go to the mouth of this same river, from lakes Belisho and Casho to surroundings of Lake Rimachi or to its islands to establish their fishing camps. All of the communities from the Chapuli, except from Puerto Alegria, install fishing camps for the entire fishing season or

until they have the amount of fish they need. People from Huambracocha and Nueva Union are near to other commercial fishing areas that are of exclusive access. Due to proximity, people from these two communities do not need to establish fishing camps there. Differently, Puerto Requena and Puerto Unguri can fish exclusively in Lake Chirapa. But they do establish fishing camps there, in addition to the campgrounds established in the mouth of Chuinda River. So, most of the fishing camps in the Rimachi area are considered areas of common access by the Kandozi fishermen. However, they have their own preferences that respond to proximity, fishing camp features, other users, and other factors that will be explained later.

Illustration 14: Fishing camp area at the Chuinda River flooded in January 2009

Figure 5.9: Fishing camps grounds in the Kandozi Territory



Fish species availability. Flooding patterns and water level not only have an effect on the availability of fishing areas, but also on fish stocks. During rising water periods, aguaje palm swamps and other types of swamps increase their flooded area. According to the Kandozi, as a consequence of this increase, fish such as tucunare, arahuana and paiche go to the swamps and use them as refuges and feeding grounds. But as soon as the water level starts to drop, fish go to open lakes.

During this migration, (also called "mijano"), fish are more easily captured by fishermen with nets, hooks and other fishing gear. The Kandozi know the "mijanos" routes and areas for fish spawning. Thus, the Kandozi go to fish in both migration and

spawning areas in order to gain access to these stocks and maximize their fishing efforts. According to the Kandozi, when water starts to rise, species such as the boquichico migrate to spawn and the people can find massive concentrations of fish that can be caught in those areas, with minimum efforts because they are spawning (Illustration 15). So, the seasonal change of water level has an effect on processes that determine if fish will be available and where they would be found and in what abundance.

Illustration 15: Harvest of Boquichico (*Prochilodus nigricans*) near Lake Rimachi

Rivers and wetland dynamics create an un equal distribution of fish availability according to Kandozi's perceptions and using previous data gathered in the area (Coral Pezo 2008). The Huangana River for example, is one of the most productive areas of the Kandozi territory, according to mestizos and Kandozi fishermen. During interviews in

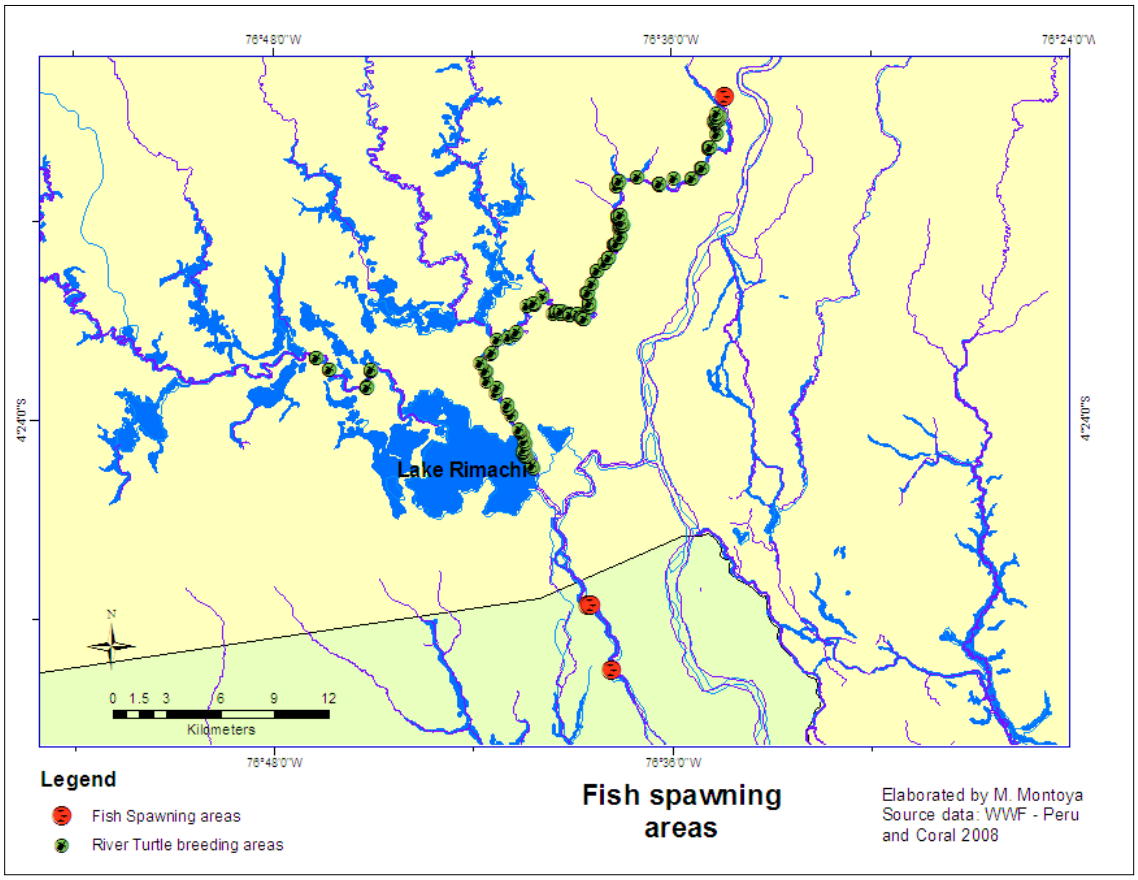
2009 they mentioned that this river receives white waters from the Pastaza River, which creates the conditions for fish to feed and to reproduce. The Huangana area is also surrounded by dense aguaje palm swamps ("aguajales), which provides protective habitats for fish.

Coral's findings (2008) also showed that a spawning area for fish is located in the headwaters of the Huangana River, confirming the productivity of this area. These particular characteristics of the Huangana river contribute to the amount of fish in this river. Other resources are also found in Huangana. Recently unpublished records of river turtle nests gathered by WWF (2009) showed that the majority of nests were found along the Huangana River (Figure 5.10). As a consequence of this abundance of resources, this area is very attractive for mestizos and for the Kandozi. However, as described before, communities from the Pirumba River have claimed exclusive access to Huangana. For that reason, this productive area is only available for the five communities located in the Pirumba area.

There are other productive areas within the Kandozi territory that are open to all Kandozi and even for mestizos. Fish spawning locations on the Pastaza River are contested areas, where both Kandozi and mestizos want to fish. These areas have been identified by Coral (2008) through scientific methods, although the Kandozi and the mestizo know these areas because they have been fishing there for decades. These spawning areas are downstream from Musa Karusha, which hinders its control by the Kandozi. The Kandozi have been trying to restrict access to these areas to mestizos using different mechanisms, but effective enforcement has been limited. The Pastaza River dynamics change the condition of the water, and consequently fish move to other areas to spawn. These spawning areas can be within and outside the limits of the Kandozi

territory. Mestizos have been claiming rights to fish just outside the Kandozi territory.

Figure 5.10: Fish spawning areas and river turtle breeding areas



Access to commercial timber extraction

During the field work period of this research in 2009, the Kandozi people denied loggers entrance to their communities, so no direct observations of timber activities were possible. However the Kandozi people located in communities that used to sell timber to loggers did answer questions regarding timber extraction activities. They mentioned that timber extraction areas are accessible all year long. However cutting and transport periods do depend on the temporal variation of ecosystems. People usually look for trees

throughout the year, but they cut them in low water level season, because it is easier to work on dry ground. Once the logs have been cut, they are left in the same place until the water level rises, because the water facilitates logs transportation (Illustration 16). Communities that have both timber areas and fishing grounds have to decide whether to fish commercial volumes or cut trees, since both activities coincide in low water level season. In some cases they could do both activities but by dedicating shorter periods of time to either one. In this case, the changing water level also affects when the Kandozi have access to timber and when they have to wait for the right moment to perform this activity.

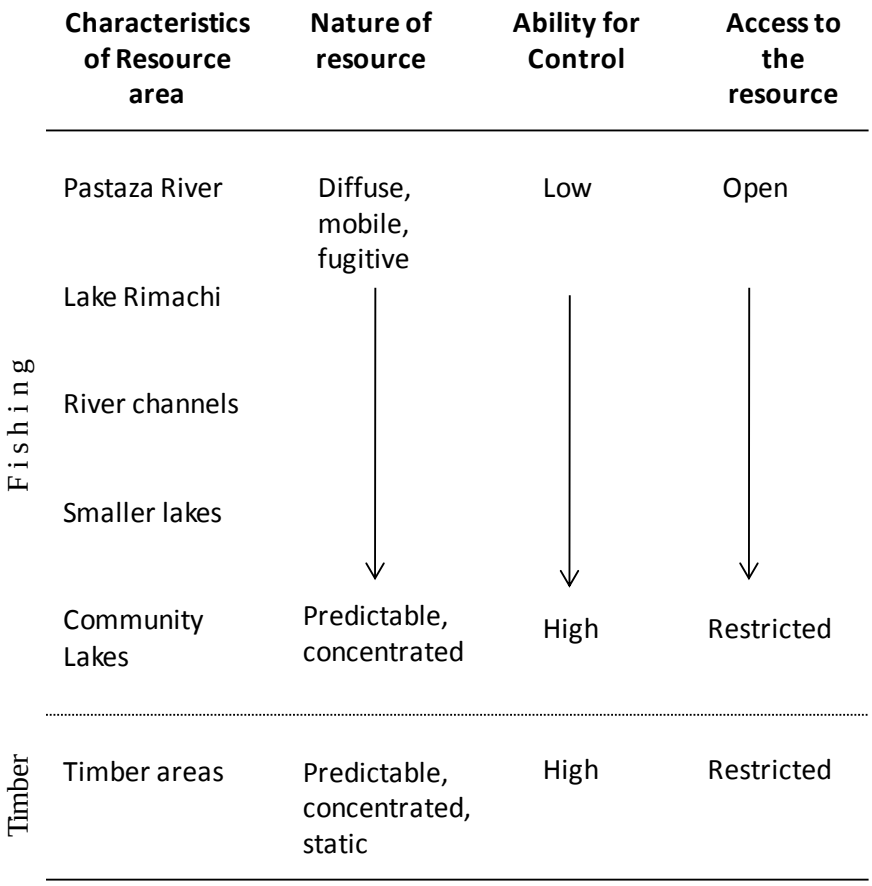
Illustration 16: Logs ready to be transported in the Chuinda River

The nature of the resources

Heterogeneity in combination with the nature of the resource also will shape access to fish and timber. Intrinsic differences between fish and timber resources and their respective extraction areas are relevant in determining the level of access (Figure 5.11). Fish species are mobile in general, but their nature may vary according to location. They will be more mobile and fugitive in areas such as Lake Rimachi, than in areas such as Huambracocha, which is a small lake with fewer connections to the other lakes or rivers. As a consequence of these differences, control and access will also vary from one fishing ground to another. Timber areas on the contrary will remain almost the same all year long, and only physical access to it can vary. The activity of extracting timber and transporting it to the cities do depend on water level, so it is seasonal. But the trees are a non-mobile resource, which makes possible its control and facilitates restrictions on access.

These differences have an effect on Kandozi decisions on what and when to harvest. Kandozi from communities in the upper basin for instance, mentioned that sometimes they prefer to cut logs because it is more certain that they will receive money from the logger, since trees are easily found and they only need to go there and cut them. While with fishing sometimes they do not know if there will be enough fish to capture, or if they will be able to fish species with a good price. Nevertheless, this decision whether to fish or do timber extraction depends also on location of the community and the physical availability of the resource.

Figure 5.11: Nature of resources and access (Modified from Thomas, 1996)



Summary and conclusions

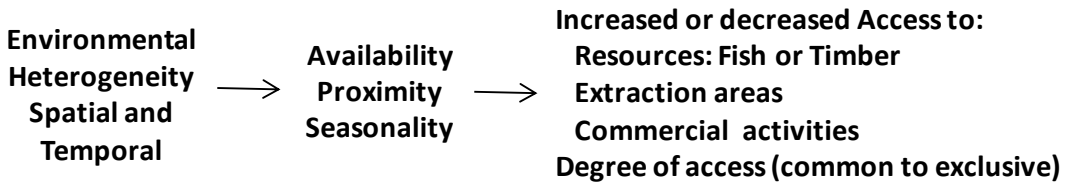
Environmental heterogeneity shapes access to fish and to timber by the Kandozi in different ways. Heterogeneity induces variations on the physical and temporal availability of resources and resource extraction areas. Therefore, access to resources will only be possible if resources or areas for extraction are available. Perhaps this is obvious but it is important to say it explicitly as mentioned in other studies (Butt 2010; Martin 2001; Pyhälä *et al.* 2006).

A heterogeneous landscape provides a variety of habitats that can be exploited.

Some are more suitable for timber extraction, and the others are better for fishing. Fish species and fish abundance may vary according to the type of habitats. This situation generates an un-even distribution of resources; hence each community will have differentiated access to each of these habitats. Due to (un-written) local rules and other institutions, the more proximate a community is to a particular habitat, the more exclusive right it has to it. However, this cannot be overly generalized. Fishing areas in particular are shared among several communities from the same basin, despite their proximity to the habitat. These habitats can be close or not to Kandozi communities.

Access to commercial fishing or timber activities is seasonal. Temporal heterogeneity influences when to perform the activity, and how much can be fished or if timber can be transported or not. Figure 5.12 summarize this last section.

Figure 5.12: Environmental heterogeneity



5.3. KINSHIP

Kinship always has been a key element for the Kandozi people as explained in Chapter three. In-depth studies of kinship have been done (Amadio and D'Emilio 1983; Surralles 2009), so this section does not offer a detailed study, however there is a need to link kinship and how people gain access to resources, since previous studies have not explained this linkage in access to natural resources for the Kandozi. Other studies in the Amazon however, have demonstrated how kinship relations between communities can

transform private property into collective appropriation (Futemma 2009).

Results from this research show how kinship is fundamental in regards access to natural resources. The Kandozi will restrict access to fish and timber to other Kandozi, if it is for commercial use or if they are not family related. Only people who live in a particular community or who have relatives in that community will have access to resources that belong to that community, either fish or timber. They consider relatives parents and siblings of both sides (husband and wife) and also parallel and crossed cousins (Amadio and D'Emilio 1983).

Establishment of kinship relationships

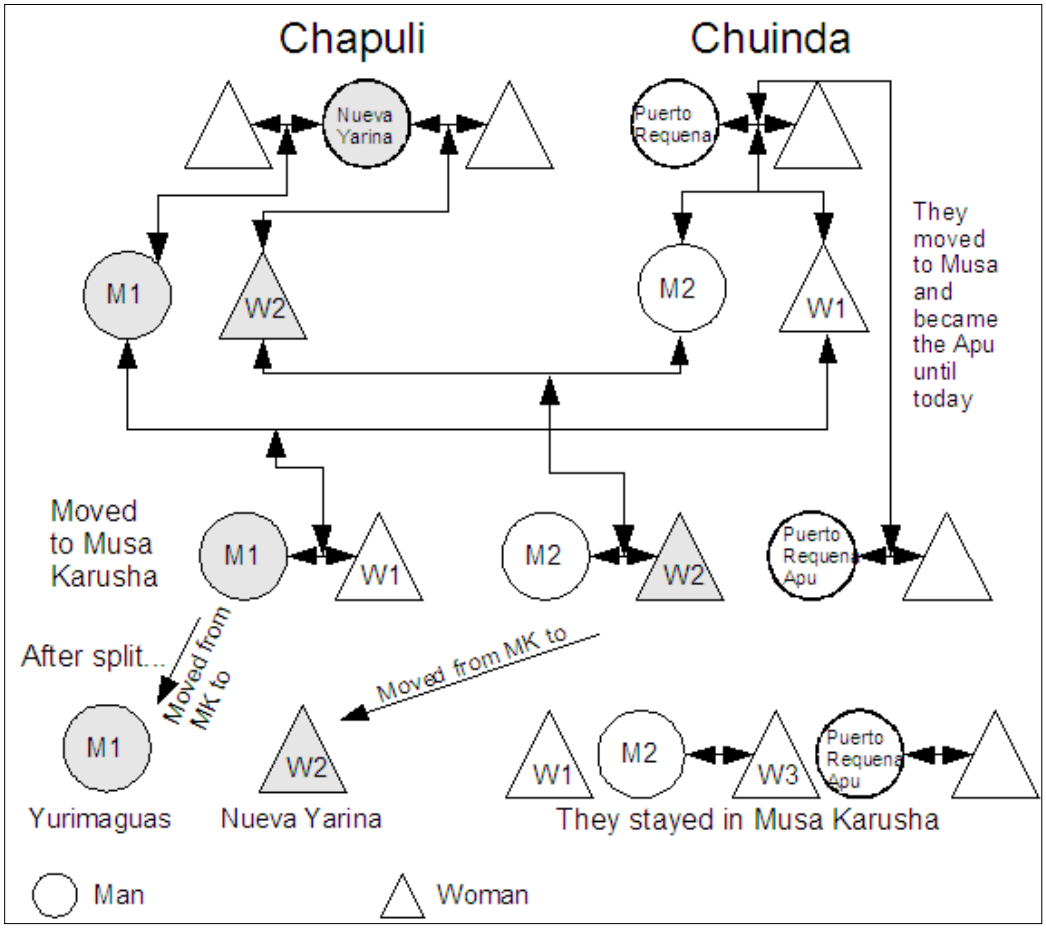
The Kandozi commonly intermarry between two groups of brothers and sisters as a way of building networks of solidarity among their families. Once the couple has got together the young man moves to his father in law's house. Married Kandozi men develop a very close relationship with their father in law (Amadio and D'Emilio 1983; Surralles 2009). Usually this also implies the young man moving to a different community. The new couple will live with the young woman's family until they have two children. By then, they have to build their own house close to the previous house where they had been living. As part of a new family, this young man has to help his father in law with different duties, such as hunting, agriculture, fishing, building canoes, and repairing the house. He also has to help other relatives (usually those relatives are his wife’s direct relatives) and other members of his new community as a reciprocity mechanism, exchanging communal labor through mingas.

In very particular cases, young couples could remain at the man's community or where he works, as in San Lorenzo, Ullpayacu or elsewhere. This is the case of the Kandozi medical technician who remains at Musa Karusha despite his wife being from

Domingo Cocha, because the health post where he works is there. He had to ask for permission from his father with law and from the apu of both communities to stay in Musa Karusha. During his free days however, he goes to Domingo Cocha to participate in mingas or to help his father in law with what he may need. Furthermore, Kandozi men who are teachers have permission to live at their work places. Whenever they can they go to their father in law's community to help with labor. Men can also be called by their families to help in their community of origin and participate in *mingas*, but this is less common according to the Kandozi who were interviewed.

During field work in 2009, young single men were found visiting different communities. It is common for them to visit siblings, or cousins in communities other than theirs, as a way of looking for girls to become their partners. Approximately a decade ago, only men decided who to marry with; they only had to ask their future father in law for permission, or the household head decided with his similar of another family if they wanted to form an alliance. But today, some parents are starting to allow their daughters to decide who to partner with and when. In some communities such as Nuevo Egipto for example, fathers are prohibiting their daughters to marry before they are 15 years old because they want to send girls to school, at least to the equivalent of elementary and middle school. This beneficial situation for women is posing difficulties to young men, because it is harder today to find a woman to marry with. They said: “ya no se encuentra mujer fácilmente, antes había ahora ya no quieren” (it is not easy to find woman, there were women before, today they do not want [to get married]). Young men need to get married to move out of their parents' house, find a place to settle and to gain access to other resource areas.

Figure 5.13: Intermarriage between Nueva Yarina and Puerto Requena



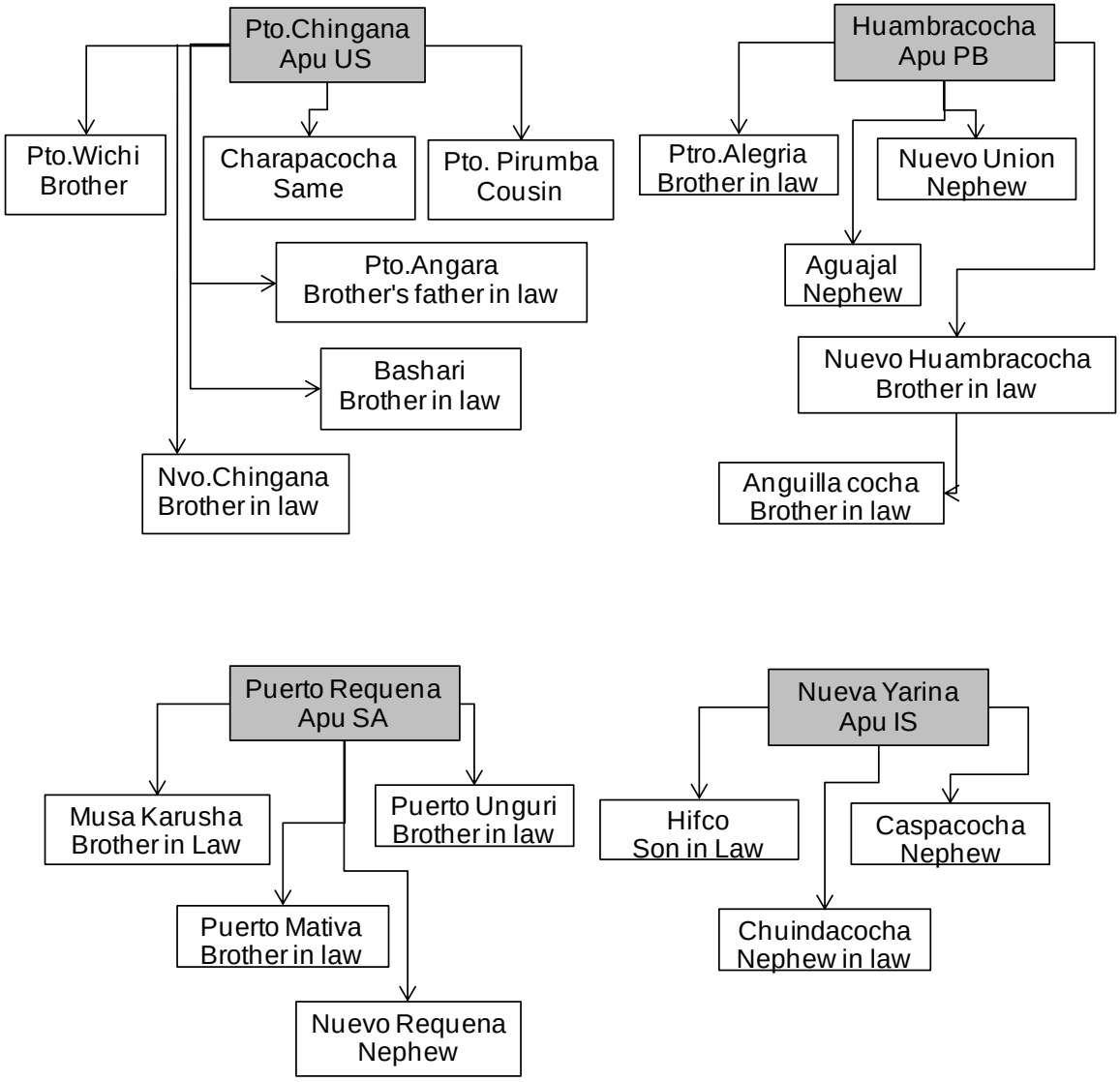
These intermarriages sometimes also generate conflicts as happened recently with two Kandozi couples living in Musa Karusha. As shown in Figure 5.13 a Kandozi man (M1), originally from Nueva Yarina community and son in law of Musa Karusha's apu separated from his wife (W1). This caused a situation such that his brother in law (M2), who had a happy marriage (they already had children) with M1's stepsister, had to give her (W2) back to her family in Nueva Yarina. Both couples used to live in Puerto Requena, where M1 had to move when he got married to W1. The entire family moved to Musa Karusha to found a community there and M2's father became the apu. They lived

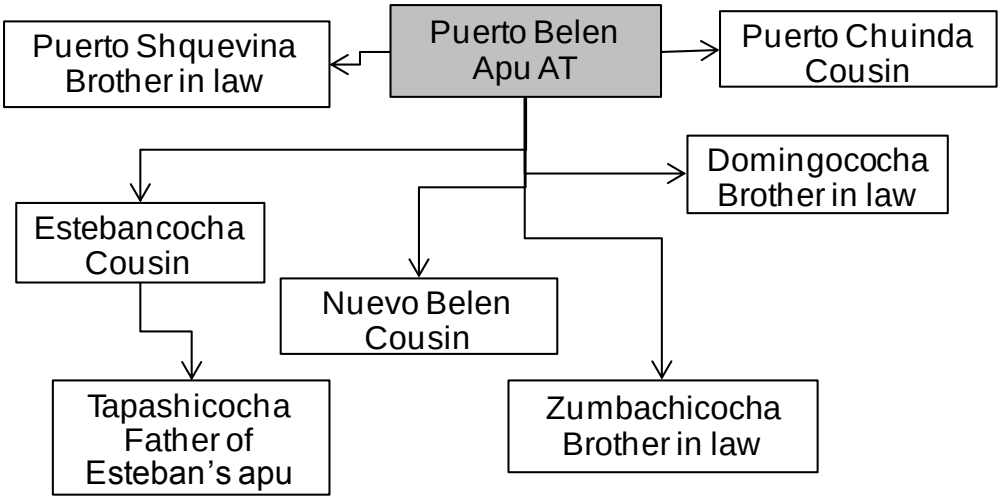
there for years. However, after both couples split M1 was not well received in Musa Karusha anymore. The woman (W2) was given back to her community but her children remained with the father, because children "belong" only to fathers (Surralles 2009). The man M2 got married again with W3 from Domingo Cocha, but they remained in Musa Karusha due to work reasons.

The separation of these two couples had broader impacts among Kandozi communities. People involved in this split are from Nueva Yarina and Puerto Requena. These communities belong to the Chapuli and Chuinda Rivers, respectively. As a consequence, relationships between people from the Chapuli and the Chuinda have weakened; hence divisions among Kandozi communities from different basins have increased. Kandozi leaders interviewed for this research partially attributed the recent division of the Federation to this problem between couples from different powerful families.

It is important to mention that within the same basin (Chapuli in particular) the communities are also grouped by kinship. Usually new communities are founded near the original one, therefore small groupings of communities that are related among them can be found. For example, in the case of Huambracocha, six communities are included in this group (Figures 5.14, 5.15). Huambracocha was founded in 1989 by a Kandozi to be called "P". The figure 5.14 shows how the other five communities are related to Huambracocha. The founder of Nueva Union is P's nephew, the founder of Puerto Alegria is P's brother in law and the other three are also relatives. So, these communities are related among them and share rules of access that will be explained in the next section.

Figure 5.14: Kin relations among Kandozi communities (Communities that originated from Huambracocha and family relations to the founder of each community and the Apu PB)




Puerto Shquevina
Brother in law
Puerto Belen
Apu AT
Puerto Chuinda
Cousin
Domingococha
Brother in law
Estebancocha
Cousin
Nuevo Belen
Cousin
Tapashicocha
Father of
Esteban's apu
Zumbachicocha
Brother in law

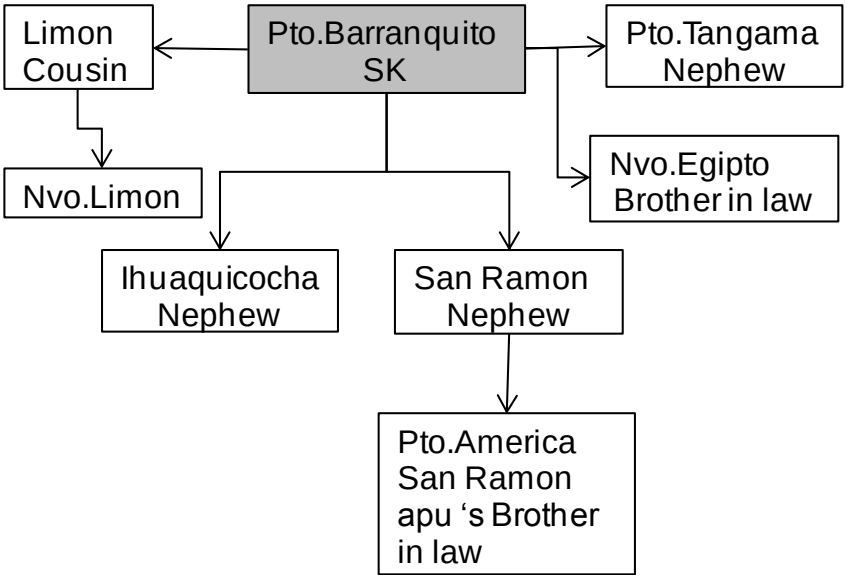
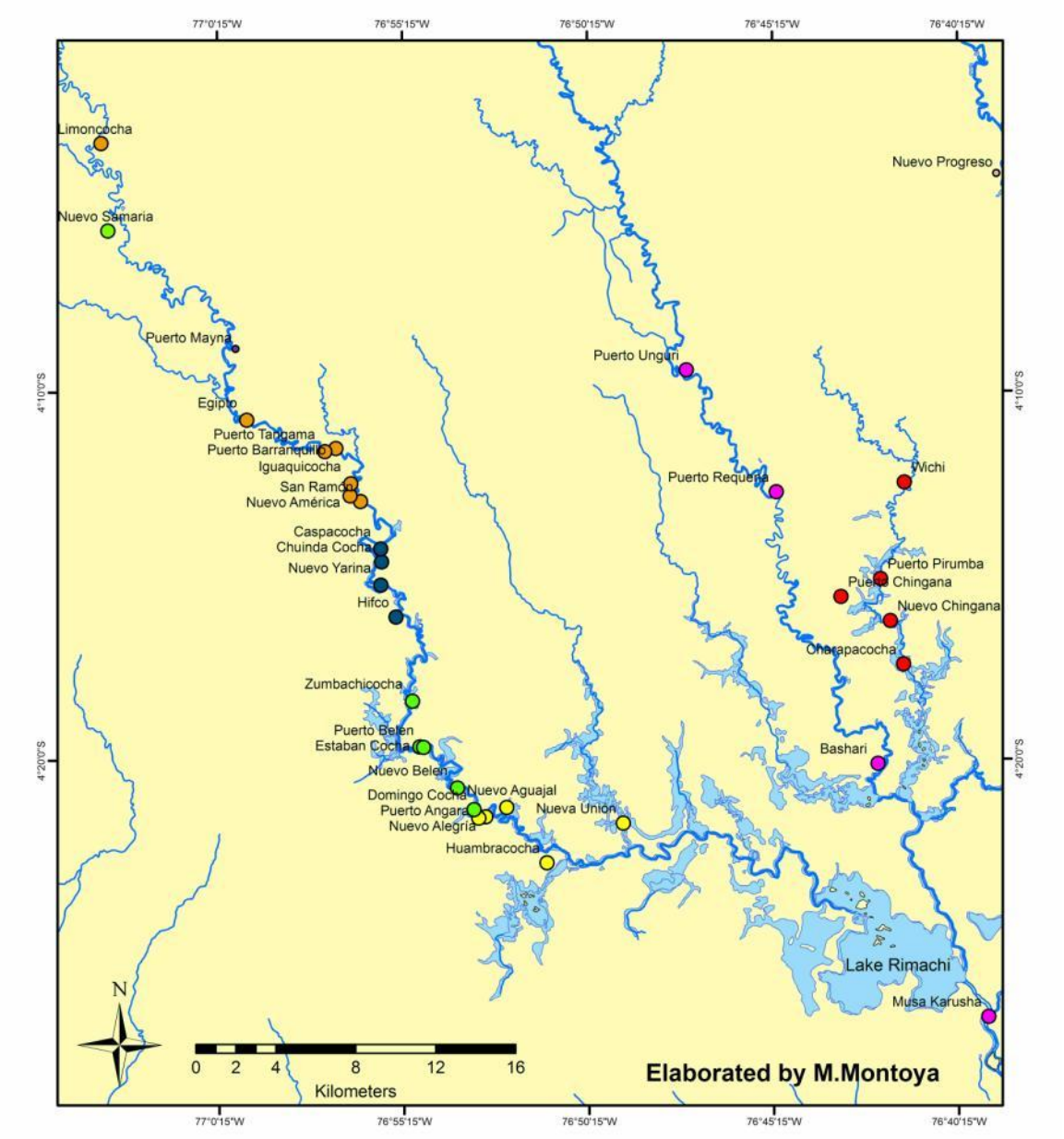

Limon
Cousin
Pto.Barranquito
SK
Pto.Tangama
Nephew
Nvo.Egipto
Brother in law
Nvo.Limon
Ihuaquicocha
Nephew
San Ramon
Nephew
Pto.America
San Ramon
apu 's Brother
in law

Figure 5.15: Location of community groups according to kinship



How kinship shapes access to natural resources

Being part of a community

Young couples have to live under the host community's rules and share communal work through *mingas*. Nevertheless young men also receive benefits from living in a new community. They gain access to the resources within the community, access to fishing grounds and access to timber areas (if any) within the community. Furthermore, young men do not lose access to resources from their original community where their relatives stay. However they do have to ask for permission to the apu to extract them. As a consequence of this internal migration either for the formation of new couples and family ties or for the foundation of a new community, a young man will increase the areas from which he can obtain resources for subsistence and for sale.

Being able to move to a different community

Not only do single men visit other communities. During field work it was common in 2009 to find also Kandozi men along or with his family visiting for a couple of days, weeks or even months, their parents, children or other relatives in a different community from where they are currently living. Visits were aimed to have access to resources that are not available where they live. If men are married, they will temporarily move with their entire family to another community and they will stay there until they have acquired what they need. Apus that were interviewed mentioned that they allow relatives to access resources from their communities or from their lakes because they have the right to do it since they used to live there or their relatives still live there. So, through kinship individuals either gain access to new areas or keep at least partial access to areas that they previously used as part of a community.

These family ties then will determine, among other factors (which will be

discussed further in following chapters), where a Kandozi household can go to fish, cut trees or gather other products. When the use of resources is for subsistence, the Kandozi will have access to resources all over their territory will little limitation. It will depend mostly on internal conflicts. The Kandozi prefer not to have trouble with others, consequently they go where they trust the people, which generally mean relatives. But if it is for commercial use, for fish and timber in particular, they will depend on kinship relationships to gain access to resources in areas that do not "belong" to the community where they are living. This unwritten rule of access is endorsed by all the Kandozi and it is one of the main reasons for internal temporary migration from one community to another. It is important to note, that while environmental heterogeneity operated at a community level, allowing people from a community to access resources, kinship provides access to individuals that can visit other communities where kinship relations exist.

During informal interviews with Kandozi people, they mentioned that Huambracocha community was one of the most "closed" communities. Everybody from other communities complained that the leader of that community (a former apu) did not allow anybody to fish in that lake, which was very well conserved and had valuable fish stocks. Some people were even scared of him. However, during my visit in Huambracocha in 2009 a young man from Domingo Cocha was there fishing with his family. He was born in Huambracocha, but was living in Domingo Cocha with his father in law. He could have located his fishing camp in the mouth of the Chapuli River, where Domingo Cocha people establish their fishing camps, but he could also commercially fish in Huambracocha where his family was. When the leader of Huambracocha was asked about this situation, he said: "acá dejamos pescar a nuestros parientes, porque hay

confianza" ("we allow our relatives to fish here because we trust them"). Other examples like this were found during field work and every person that was asked re-affirmed that these temporal visits for resource extraction were related to kinship.

Another example of how kinship operates to facilitate access to resources by individuals is the case of Lake Acaba. Families from Musa Karusha have self-regulated such that they have exclusive access to fish in Lake Acaba, partially due to proximity (previous section). This lake can be easily accessed from Lake Rimachi and from the Pastaza River. Therefore many other fishermen want to enter this lake to fish. Musa Karusha's apu does not allow other people to fish here, and has even been using his guns to prevent others from entering this lake. Several Kandozi during informal conversations in 2009 manifested their disagreement with Musa Karusha's apu's behavior. But he and his community do not have the capacity to control the lake and prevent mestizos or other Kandozi from entering Lake Acaba. As a consequence, the apu of Musa Karusha invites members of the Puerto Requena community to fish in Lake Acaba and in exchange, they help with the lake's control. The reason why Musa Karusha's apu invites members of Puerto Requena and not other people is because they are his relatives (in this case, nephew). He used to live in Puerto Requena but he moved to and established Musa Karusha in 1992 with his sons and daughters, both single and married. So, this is a great opportunity to Puerto Requena, since they can access fish in Lake Chirapa due to proximity, but they can also fish in Lake Acaba. In this case, access has been gained at the communal level and not by individuals, since the apu has invited people from that community to have access to Lake Acaba.

Excluding people from areas that are controlled by kin groups

Apus from Charapacocha and Puerto Wichi communities are brothers in law of

Puerto Chingana's apu. Apus from Nuevo Chingana and Bashari are also relatives of the other three communities' apus. So, most of the people of these communities are kin. Therefore they share areas in this basin for fishing and exclude other Kandozi from this area. The Pirumba basin has a number of lakes that are exclusively used by the five communities. People from these communities establish their fishing camps specifically in Lakes Pirumba and Huangana-Tapaje. Only people that have relatives elsewhere go to Lake Rimachi areas or Chapuli to establish camps. However, in the case of timber, each community within the basin has its own timber extraction area and although people have relatives, they do not share timber among them if they are from other communities. This is because rules of access to timber areas are controlled predominantly by land titles (see next section).

Marriage has traditionally been used as a mechanism to reduce conflicts between any two Kandozi families (Surralles 2007, 2009). The Pirumba case is useful to show how kinship in general can reduce conflicts among Kandozi people. As mentioned, everyone from Pirumba communities has access to lakes located in this basin. However, people from Charapacocha community were contracting mestizo fishers to come into this area and fish with big gill nets such as "paicheteras" and "paqueras", which are nets to fish paiche and paco, both fish species with high prices and very valuable for the Kandozi and mestizos. This situation generated conflicts among these communities since all communities had an agreement on not contracting mestizos. During interviews in Puerto Chingana and Pirumba communities in January 2009, people were very upset with this situation and they explicitly mentioned that Charapacocha "is family", but that they were not respecting previous agreements. These same people mentioned a few violent encounters between people from Charapacocha and the rest of the Kandozi communities

in other basins. This tense situation is what worried all of them because of the level of the conflict that the Kandozi dislike, especially among family members. Charapacocha people were excluding other Kandozi, but were bringing mestizos to the area.

As a consequence of the level of the conflict in March 2009, people were frustrated with the situation with fishing and felt that they had to do something: "nosotros no podemos estar así entre parientes" ("we cannot be like this [in conflict] among relatives"). People from Puerto Chingana, with other communities' support (from the Pirumba basin) decided to talk directly to Charapacocha and urge them to follow the rules and agreements regarding fishing. After long discussions, the level of the conflict dropped and all of them agreed again to take care of their lakes and not to allow mestizos to fish in their areas. Pirumba basin communities wanted to have exclusive access to their fishing areas. They mentioned during interviews that if the Charapacocha people had not been relatives, the solution may have been different, and probably the person promoting contracts would have been killed, as the people from other basins wanted to do.

Box. 1: Fishing Contracts: Agreements between the Kandozi and mestizo fishermen

For more than a decade, the Kandozi have been making agreements with mestizo fishers from Ullpayacu and San Lorenzo in order to obtain cash income. The Kandozi allow the mestizos to fish within their territory if mestizos give the Kandozi money in exchange. This exchange is called a fishing contract and there are of two kinds:

1. The Kandozi and the mestizo agree on two things; a certain quantity of money that the mestizo has to pay the Kandozi, and a certain amount of days that the mestizo has to fish within the Kandozi territory. The mestizo enters the Kandozi territory and fish for the number of days he has agreed on and pays the Kandozi only the fixed amount of money

that was part of the contract. The amount of money that was agreed can be reached in only one day of fishing or cannot be reached. But in spite of this, the mestizo has to pay the Kandozi what they have agreed and also he can stay for the entire period that he has in the area. So, the mestizo can fish all that he wants while his period last, without any restriction. The Kandozi will receive the money without doing anything, just waiting for the mestizo to finish his period.

2. The other kind of contract is called "fifty-fifty". The Kandozi and the mestizo agree only in a certain number of fishing days within the Kandozi territory. From the entire mestizo's catch, the Kandozi will receive 50% of the fish, without doing anything. The Kandozi can sell his 50% of the fish harvested to the same mestizo that did the contract with him or to somebody else.

In both cases, fishing contracts are a beneficial situation for the Kandozi in which without doing anything, they are either receiving money or fish. However, they are not taking in consideration the impact of the fish stocks.

Fishing contracts are not allowed under the fishing law and although the Kandozi have agreed among them to halt fishing contracts, there are still people who are making agreements with mestizos.

Summary and conclusions

As seen in previous subsections, kinship helps individuals gain access to natural resources, fishing grounds and timber extraction areas, especially for commercial use through institutionalized rules (Figure 5.16). When somebody moves permanently to a different community for marriage, this person gains access to new areas where he can fish or extract timber. He also maintains his rights to use resources from his community of origin. Kin relations also allow people to visit relative's community to have access to

fish and timber. However, apus will have to give permission for the visitant to use resources, especially for timber. These rules of access in relation to kinship are also influenced by the spatiality in fisheries and timber extraction.

Kinship also favors an entire community to have access to a particular area, when most of the people living in both communities are relatives, or at least the majority of them (e.g. Musa Karusha and Puerto Requena case). Furthermore, members from communities who are kin, such in the case of Pirumba, have access to exclusive areas and are able to restrict access to mestizos and also to Kandozi people.

Through kinship relations, people also attempt to find less-violent ways of solving conflicts for resources and try to look to agreements between social groups that are related through family ties. Thus, a better understanding of kinship relations and its associated rules of access is necessary in order to reduce conflicts among resource users by distributing access to fish and timber equally among the Kandozi.

Figure 5.16: Kinship and effects on access to natural resources

5.4. LAND TENURE AND COMMUNAL BOUNDARIES

Land tenure is a factor that has been increasingly shaping access to natural resources in the last two decades in the Kandozi territory and elsewhere in the Amazon (Chirif and Hierro 2007; García Hierro and Surralles 2004). A communal title establishes the limits of a Kandozi community, and although there is no physical demarcation in place, people are aware of what part of the territory and ecosystem types are included in

the titled area. This situation allows people ascribed to a particular community to prevent Kandozi people living in another community to commercially extract timber from their lands.

Land tenure and self-recognition of community boundaries are relevant factors especially for timber extraction, since they will determine the type of ecosystems and resources that can be used within a community by its members. For commercial fishing, land tenure has not been so critical, since lakes cannot be included in a title according to the Peruvian Constitution. However this restriction has been not applied in all cases and some titles do include water bodies, such as the case of Huambracocha. Forests and lakes are of the state property in spite of indigenous community titles. However, due to Kandozi's access rules, land tenure is increasingly becoming a factor that facilitates access to timber and lately to commercial fishing too. As demonstrated in other studies (Roth 2009) it is important to understand that "land tenure institutions are not limited to legal enforcement of private property but can rather be thought of as systems of social relations that encompass property rights, rules of access, inheritance and use" (p.214). This section explores how land tenure regimes and community boundaries facilitate or limit access to resources, fish and timber in particular.

Titling and delimitation processes of Kandozi communities

Titling in Peru is a long process that not only includes several steps and governmental involvement and procedures, but it can also take several years of paperwork. The following is a simplified description of this process. First, a Kandozi community has to be established, which includes the construction of a few houses. The number of houses can vary. It will start usually with one or two houses from the same family and from there the community can grow. They will start planting plantains and

manioc at the least. This can be all that is needed to be considered a community by the Kandozi.

Once a community is established, the Ministry of Agriculture has to first do a legal recognition. This involves a technician visiting the community and delimiting its borders on a map, separating the agricultural area from the forest area. Once the community has a map, boundary agreements with adjacent communities, and additional documentation, it has to be registered in the Public Records by the legal authority of the community, who is the apu. The last step is the accreditation of the title holder, but this process can take years if not decades (Table 5.6). In order to expedite the process, some communities asked to be recognized as annexes of the title holder's community. This facilitates processing the recognition of these communities. Therefore the majority of communities claim to be annexes of other communities, but they only have the title and the map of its holder community; they do not appear on the maps.

Table 5.6: Land tenure status (as of May 2009)

Community	River	Official condition	Included in the title of	Regis-tration year	Titled year	Demarca-ted area (ha)	Titled area (ha) ownership
1.Nueva Yarina	Chapuli	Title holder		1981	1991	43609.39	37935.00
2.Capirona	Chapuli		Nva. Yarina (sector Nva. Yarina)				
3.Nuevo Belén	Chapuli		Nva. Yarina (sector Nva. Yarina)				
4.Domingo Cocha	Chapuli		Nva. Yarina (sector Nva.				

			Yarina)				
5.Hifco	Chapuli		Nva. Yarina (sector Nva. Yarina)				
6.Caspa Cocha	Chapuli		Nva. Yarina (sector Nva. Yarina)				
7.Chuinda Cocha	Chapuli		Nva. Yarina (sector Nva. Yarina)				
8.Puerto Barranquillo	Chapuli	Annex holder	Nva. Yarina (sector Pto. Barranquillo)				
9.Nuevo Caimito	Chapuli		Nva. Yarina (sector Pto. Barranquillo)				
10.Nuevo América	Chapuli		Nva. Yarina (sector Pto. Barranquillo)				
11.San Ramón	Chapuli		Nva. Yarina (sector Pto. Barranquillo)				
12.Puerto 13.Tangama	Chapuli		Nva. Yarina (sector Pto. Barranquillo)				
14.Samaria	Chapuli		Nva. Yarina (sector Pto. Barranquillo)				
15.Nuevo Egipto	Chapuli		Nva. Yarina (sector Pto. Barranquillo)				
16.Ihuaqui Cocha	Chapuli		Nva. Yarina (sector Pto. Barranquillo)				
17.Puerto Mayna	Chapuli		Nva. Yarina (sector Pto.				

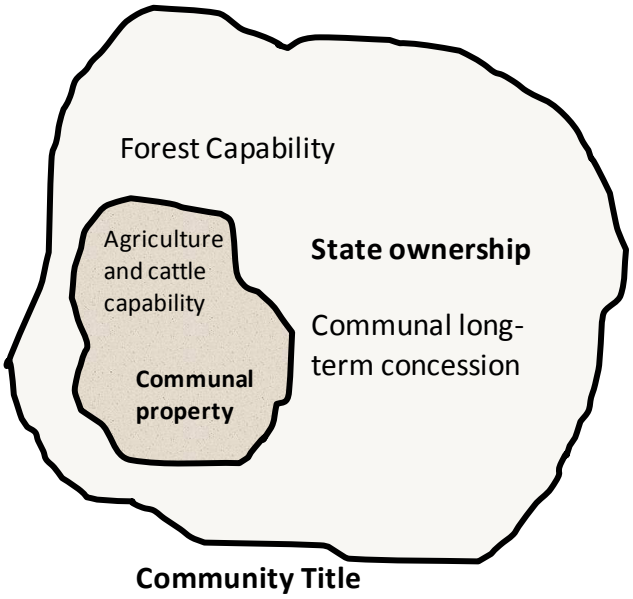
			Barranquillo)				
18.Puerto Belén	Chapuli	Annex holder	Nva. Yarina (Sector Puerto Belén)				
19.Tapashi Cocha	Chapuli		Nva. Yarina (Sector Puerto Belén)				
20.Sumbachi Cocha	Chapuli		Nva. Yarina (Sector Puerto Belén)				
21.Limón Cocha	Chapuli	Title holder		1988	1991	7050.00	3450.00
22.Nvo. Limón Cocha	Chapuli		Limón Cocha				
23.Musakarusha	Pastaza	Title holder - inscrip-tion only		2001			
24.Huambra Cocha	Lake Huam-bracocha	Title holder		1989	1992		
25.Nueva Alegría	Chapuli		Huambra Cocha				
26.Nueva Huambra Cocha	Lake Huambra-cocha		Huambra Cocha				
27.Nueva Unión	Chapuli		Huambra Cocha				
28.Puerto Aguajual	Chapuli		Huambra Cocha				
29.Puerto Angara	Chapuli		Huambra Cocha				
30.Puerto Chingana	Pirumba	Title holder		1975	1985	1465.00	1465.00

31.Nuevo Chingana	Pirumba		Puerto Chingana				
32.Puerto Pirumba	Pirumba		Puerto Chingana				
33.Puerto Wichi	Pirumba		Puerto Chingana				
34.Bashari	Pirumba		Puerto Chingana				
35.Charapa Cocha	Pirumba		Puerto Chingana				
36.Puerto Requena	Chuinda	Title holder		1975	1984	6964.15	5744.15
37.Puerto Unguri	Chuinda		Puerto Requena	2005			

At present, only five Kandozi communities from the study area own a property title. Two communities are recognized as official annexes of two different title holders. Only Musa Karusha has been registered in public records (registros públicos) but it is still in the process of waiting for its accreditation as a title holder (Table 5.6). Communities that are annexes from others, have the same characteristics (population, internal organization, services) as titled communities. Annexes self-recognize among themselves as individual communities, regardless of its legal formal tenure status. They do not have a map indicating internal borders (within the title) but they have agreed on internal boundaries, which are well known by each household. Titled communities do have a map of the area that it is part of the titling documentation. Nonetheless, these maps were done without modern technology and proper equipment. Consequently maps are inaccurate and do not represent well the terrain, especially rivers and lakes. A titled community can have several communities as annexes and usually these correspond to communities with some level of kinship relations.

The total area included in the title documentation is not owned by the community title holder. Communities have an area which is under state ownership (forest potential) and an area that is actually under communal property (agricultural and cattle potential). By law, communities only own the portion of the title that has agriculture and cattle production potential (determined by the Ministry of Agriculture), and the area with forest potential is under state property and granted to communities as a long term concession. Each title has this information on the document, but again, these measurements were done without accurate equipment (Figure 5.17 and Illustration 17).

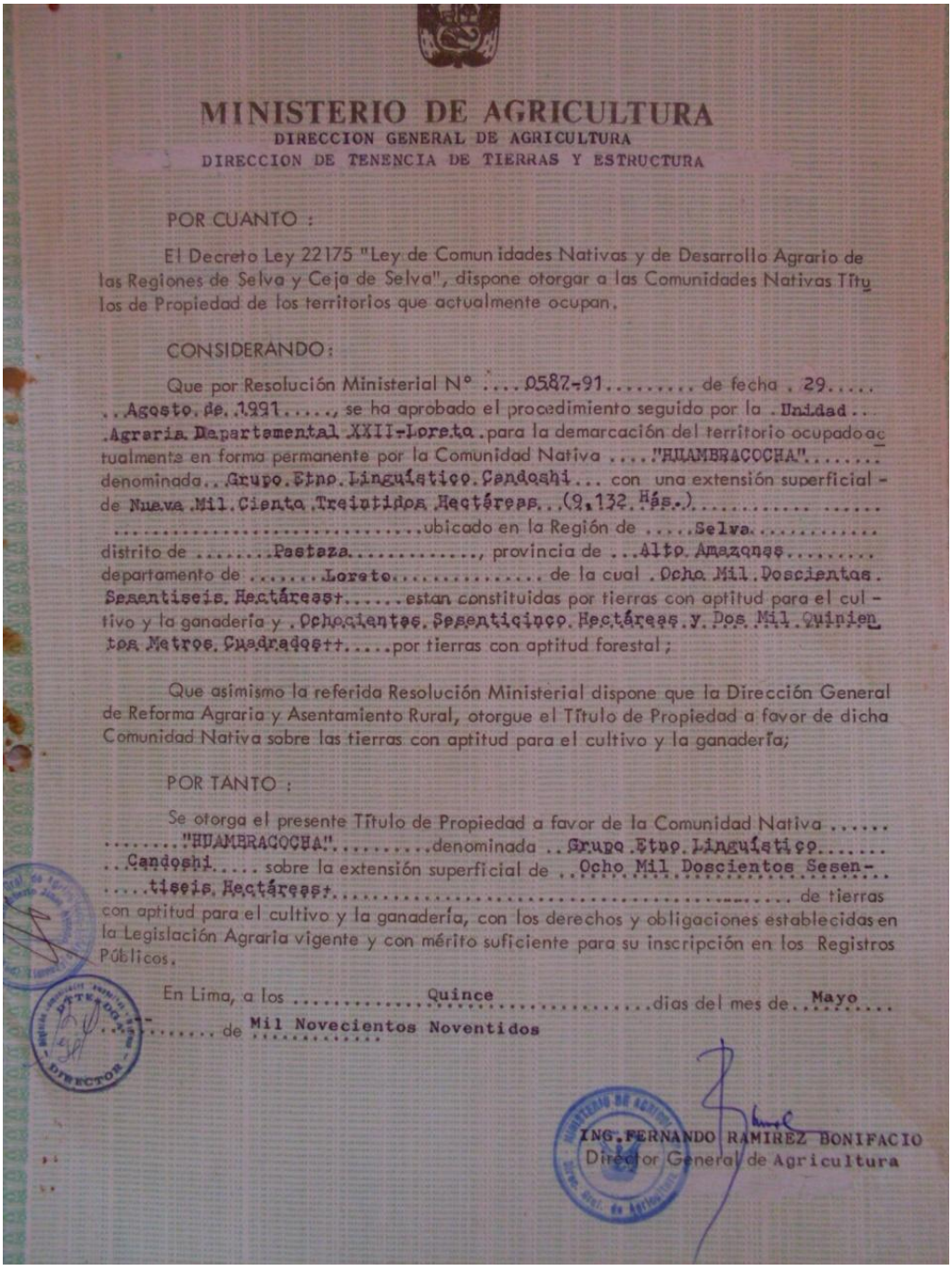
Figure 5.17: Configuration of a titled community



Landmarks do not exist between communities that are annexes. But each community has a clear sense of its own boundaries (legally enforced or not) and the Kandozi relate these boundaries to land tenure. They know what rivers or streams delimit

their communities and what type of ecosystems are included. No serious boundary conflicts exist among Kandozi communities, but some of them mentioned that they need to expand their titled or internally agreed area, because it is insufficient for the amount of people they have, or because they need to incorporate more lakes or forested areas. There are large areas that are not covered by titles or by the official maps, so with an accurate process of demarcating the territory and each community, the Kandozi would have the possibility of discussing among themselves the expansion of titled lands, without entering in conflicts. NGOs such as WWF and Shinai Serjali have begun helping the Kandozi with the process of community demarcation and the elaboration of new maps for their communities. But these maps may not represent the complexity of the spatiality of access to fish and timber (Roth 2009; Sletto 2009). Furthermore this map would need to have governmental recognition in order to be enforced, which is a much longer and bureaucratic process.

Illustration 17: Title document of Huambracocha



MINISTERIO DE AGRICULTURA
DIRECCION GENERAL DE AGRICULTURA
DIRECCION DE TENENCIA DE TIERRAS Y ESTRUCTURA

POR CUANTO :

El Decreto Ley 22175 "Ley de Comunidades Nativas y de Desarrollo Agrario de las Regiones de Selva y Ceja de Selva", dispone otorgar a las Comunidades Nativas Títulos de Propiedad de los territorios que actualmente ocupan.

CONSIDERANDO:

Que por Resolución Ministerial N° ....0587-91..... de fecha . 29..... ..Agosto. de. 1991....., se ha aprobado el procedimiento seguido por la .Unidad.. .Agraria Departamental XXII-Loreto .para la demarcación del territorio ocupado actualmente en forma permanente por la Comunidad Nativa ....."HUAMBRACOCHA"..... denominada..Grupo.Etno.Linguístico.Candoshi... con una extensión superficial de Nueva.Mil.Ciento.Treintidos Hectáreas..(9,132.Hás.)..... ....ubicado en la Región de .....Selva..... distrito de .....Pastaza....., provincia de ...Alto.Amazonas..... departamento de .....Loreto..... de la cual .Ocho.Mil.Doscientas. Sesentiseis.Hectáreas+.....estan constituidas por tierras con aptitud para el cultivo y la ganadería y .Ochocientos.Sesenticinco.Hectáreas.y.Dos.Mil.Quinientos Metros.Cuadrados++.....por tierras con aptitud forestal;

Que asimismo la referida Resolución Ministerial dispone que la Dirección General de Reforma Agraria y Asentamiento Rural, otorgue el Título de Propiedad a favor de dicha Comunidad Nativa sobre las tierras con aptitud para el cultivo y la ganadería;

POR TANTO :

Se otorga el presente Título de Propiedad a favor de la Comunidad Nativa ...."HUAMBRACOCHA".....denominada ..Grupo.Etno.Linguístico..... ..Candoshi..... sobre la extensión superficial de ..Ocho.Mil.Doscientos.Sesen-..... .....tiseis.Hectáreas+..... de tierras con aptitud para el cultivo y la ganadería, con los derechos y obligaciones establecidas en la Legislación Agraria vigente y con mérito suficiente para su inscripción en los Registros Públicos.

En Lima, a los .....Quince.....dias del mes de.....Mayo ..... de Mil Novecientos Noventidos .....

ING. FERNANDO RAMIREZ BONIFACIO
Director General de Agricultura

How land tenure and community boundaries shape access to fish and timber

Overall, Kandozi rules on how communal titles shape access at present show that land titling has a greater effect on timber extraction than fishing, especially if it is for selling timber to the logger. A household head in Puerto Angara community said:

> el título sirve para sacar madera, para eso si tienen que pedir permiso. En cambio para carne y pesca no hay necesidad de pedir permiso, ya hay áreas para eso, cada comunidad tiene su cocha donde pesca (the title serves for timber extraction, and people have to ask for permission for that. Permission is not needed for game or fish; areas for those resources already exist, each community has its own lake).

Answers to questions and during informal conversations were similar to the one cited above. They indicated that the title of a community or community boundaries (of annexes) will clearly delimit the forest that they can use for timber, but lakes are not "owned" by a community because of a title, it is more due to proximity or kin (see previous sections). So, in practical terms it seems that what matters to locally assigned timber resources to a community are the internal boundaries and the title per se when they have one. The Kandozi knew very clearly which timber area corresponded to each community.

In few communities (two out of eighteen) people said that land titles have started to have an effect on access to commercial fishing as well. But this situation only applies to communities that have lakes within the titled area, usually communities located in the lower portions of the Kandozi territory. A man from Puerto Requena said:

> antes del título nadie mezquinaba, pero ahora todos mezquinan en la comunidad, hasta para pesca. Antes era mejor. (before having a title, nobody was ungenerous with others, but today everybody is reluctant to share timber resources and even fish. Past time was better).

This quote shows that new rules have been created regarding access to resources. These rules have an effect on access at the communal level, since restrictions are for

communities and not for individuals.

Access to timber

Regarding access to timber for sale, rules related to land tenure and community boundaries will determine if a community has access to trees or not. In order for a household to access timber, first of all his community needs to include an area with timber. If it does, through communal meetings households and the Apu will determine how many trees each household needs to sell. Once they have reached an agreement on how many trees they will cut, then they negotiate with the logger. They need to commercialize with the logger, because they cannot do it by themselves. They lack permits, tools (tractors, chainsaw, etc), they do not have market connections and do not know routes of commercialization. Besides, timber extraction is used by the Kandozi as a mechanism of obtaining cash before even cutting the trees.

So, if the community does not have timber areas within its boundaries, none of the households will have access to a tree elsewhere. They can have access to trees in their relatives' communities with previous permission of the apu, but only if trees are used to build canoes. Rarely a Kandozi will obtain permission for cutting trees for commercial use in a community different that his. Thus, both titles and un-written boundaries of communities are essential for people in a community to access timber areas and for gaining access to individual trees.

If a community wants to commercialize and transport timber to market, communal boundaries are not enough; the community needs to hold a title. It does not matter if transportation is done by community members or by the logger. According to the forestry law (which will be further discussed) timber can only be commercialized from titled communities. As a consequence, Kandozi communities that lack a title, have

to look for alternative ways to meet this requirement. Only five communities hold a title, so only those can legally commercialize timber. Communities that are "annexes" of title holders have to ask them for permission to use the title for timber extraction. However, this situation is considered illegal under the national forestry law.

The best known case of a community using another's title is Puerto Unguri. Puerto Unguri is a newly formed community that has only been recognized as a community by the land authority (Ministry of Agriculture), but does not have a title. Puerto Unguri does have large extensions of forests with valuable cedar trees. Puerto Requena community which is downstream from the former also includes large areas of forest and it is titled. Therefore, what Puerto Unguri does is the following: the apu and community members negotiate with the logger, separated from Puerto Requena and agree on the number of trees that they want to sell from their community. However, they give the logger Puerto Requena's title in order to allow him to sell this timber elsewhere. Consequently, when the logger commercializes this timber, it appears that he is commercializing timber from Puerto Requena community and not from Puerto Unguri. A household from Puerto Requena has said:

> Nadie puede sacar madera de su comunidad sin el título, ni Puerto Unguri. Pero Unguri ha conversado con el apu de Requena, para que Johny [el maderero] pueda usar su título para el permiso, pero sacando madera de su zona (nobody can extract timber from its community without the community title, not even Puerto Unguri. But Puerto Unguri had request to Requena's apu to allow them to use its title, but extracting timber from its (Puerto Unguri) area).

It is clear how both communities acknowledge the fact that they have forest areas where they can access timber. But because of external legal frameworks they have to find solutions through internal agreements to avoid legal requirements. (This will be further

discussed in the next section).

In the case of the Nueva Yarina title, which incorporates 18 other communities as annexes, the situation is different since these other communities are part of the title. So, when loggers extract timber from for example Ihuaquicocha's forest, they are able to use Nueva Yarina's title for commercial purposes because it legally incorporates Ihuaquicocha. Nevertheless, Ihuaquicocha can only extract timber from its own area, and has to ask the apu from Nueva Yarina for permission to use the title. In this case again, community boundaries are essential to determine the area from which Ihuaquicocha can extract its timber.

As seen from both cases, there are two different situations. Communities such as Puerto Unguri that lacks a title, and hence needs to make internal agreements with Puerto Requena in order to use its title and be able to extract timber. There are other situations in which communities comply with requirements and have a title for commercializing timber. But in both cases, what matters internally for the Kandozi to access timber are the boundaries between communities, regardless of the legal title. At the end, governmental authorities who control forest activity cannot determine where the timber is coming from.

Access to fish

As mentioned in the previous section, each community has its own exclusive or shared area for fishing. In most of the cases, subsistence fishing is common access, but for commercial fishing people have rules. As in the case of timber, efforts for titling the Kandozi territory through community titling processes have reinforced the idea of ownership among the Kandozi. This new way of relationship with the land and with water bodies is generating among the Kandozi the need to incorporate lakes within titled or delimited communal areas.

Lakes that are close to Lake Rimachi and the first portions of Chuinda and Chapuli Rivers (excluding Lake Acaba), are considered as common access to the Kandozi, but restricted from mestizo fishers. The Kandozi still feel (according to interviews in 2009) that Lake Rimachi belongs to them. It is not included within anyone's community, but it is the core of the Kandozi territory, so everyone who is a Kandozi should have access to it.

Other lakes on the contrary, such as Huambracocha, Union, Chirapa and Pirumba, have been included within community boundaries. Huambracocha for example, is a community that has a title and 5 annexed communities and includes Lake Huambracocha in its map. This map is of very poor quality and does not illustrate where the annexes are. However, this map is used by people from Huambracocha to claim ownership of Lake Huambracocha. Communities that are annexes of them have to ask for permission from the apu to commercially fish there. But communities outside the titled area will be able to fish there only if kin relations exist with somebody from Huambracocha. Legally, this is not easy as the Peruvian Constitution does not allow exclusive access in or ownership of water bodies. So, rules of access to fish in relation to land tenure and community boundaries will vary according to communities, and whether they have lakes within or without their boundaries, and whether they acknowledge national laws.

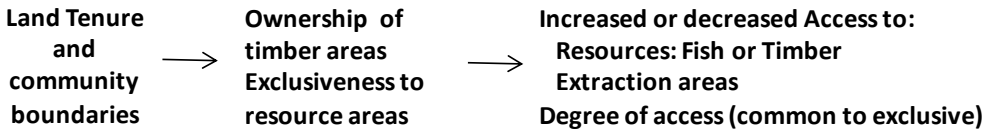
Summary and conclusions

Timber extraction areas correspond to areas that are part of each community's title or are within each community's internal boundaries. This notion of timber ownership is one of the most important effects that the titling process has had in the Kandozi communities. Before having a title, communities could extract timber from anywhere in the Kandozi territory, but afterwards or after establishing permanent settlements, each

community has a more restricted area with which to commercially extract timber. Consequently spatiality of resource use is more evident at present.

Fishing is following this same trend (Figure 5.18). Some communities are arguing that they have ownership of lakes that are within their title. Land tenure is also relevant for the creation of new communities, since internal migration processes are also responding to the need of having larger areas for timber extraction. The Kandozi are regulating how community titles and community boundaries are shaping access to fish and timber, and this has an effect at both the community and the individual level. Fishing grounds, species distribution and density and other conditions are also contributing to the spatiality of land tenure institutions as it has been shown in other studies (Roth 2009).

Figure 5.18: Land tenure and its effects on access to natural resources



5.5. LEGAL FRAMEWORKS

Legal regulations affect access to the land and to natural resources. Changes have induced serious and violent contestations between indigenous people in the Amazon and the Peruvian government. Protests and strikes that occurred in several Amazonian cities, such as Yurimaguas (2008) and Bagua (2009) (Anaya 2009; International Federation for Human Rights 2009) reveal the difficulties of these contestations. Therefore, this section only analyzes how the forestry and fishing legal frameworks had an effect on access before 2009, since new modifications are still being debated and most of the people are not yet aware of them in the Kandozi area. Furthermore, field work was done previous to

the violent events in Bagua, which occurred in June 2009.

The Forestry and Fauna law and fishing regulations shape access in different ways. The forestry legal framework promotes timber extraction only by titled communities and as a consequence, only those communities can commercialize timber. The fishing legal framework on the contrary, promotes the creation of fishermen associations whose members will gain access to lakes or rivers that are in theory state property. Another difference lies in the level of control to the resources. The forestry activity is subjected to state control whereas fishing is controlled by local surveillance committees. Both activities necessitate fulfilling several requirements, such as the preparation and approval of management plans and in both cases the lack of technical and financial support will prevent the Kandozi from completing these requirements.

Forestry legal framework

The current forestry law is designed to promote a sustainable use of the forest and aims to modernize the forestry sector starting in year 2000. Nevertheless, requirements (see Box. 2) are so far from the Kandozi's possibilities of implementation that the law and its regulations have not been carried out in the study area. Most of the Kandozi today are cognizant that there is a list of requirements, such as the forestry permit and the management plan that they need to comply with, but they do not have the means (monetary, logistic, language, technically) to do it. Consequently loggers began to act as communal representatives and they have been processing the permits according to their interests, as elsewhere in the Amazon (Ryan 2008).

The loggers' modus operandi

General case in the Amazon. Governmental authorities in Yurimaguas in charge

of the supervision of timber extraction in the Pastaza area know how loggers operate to cut and commercialize timber from indigenous communities. Authorities explained during interviews in 2009 that loggers convince communal presidents to sign the letter that authorizes the logger to represent the community to the forestry authority. With this letter the logger can process the forestry extraction permit. It is only possible to process permits for title holder communities with a tax number (known as "R.U.C."). So, in cases where communities do not have a title, loggers illegally use permits from other areas to extract timber. In addition, they present to the authorities a forestry management plan that has been done without real information from the field but that superficially complies with the requested information. Forestry authorities in Yurimaguas accepted in 2009 that this mode of operation of loggers is similar elsewhere in their jurisdiction.

The Kandozi case. When a logger visits Kandozi communities he tells the people that he has all the permits to extract timber from their communities, and the Kandozi tend to believe him. But today, governmental and Kandozi authorities are conscious how loggers use fraudulent documentation and how they manipulate the Kandozi to obtain permits. Nonetheless, according to the law, loggers are only representatives of communities, hence they are not responsible for any illegal action. Apus or communal presidents are responsible legally for community's activities. If the authority finds a community extracting timber from an area that is not titled or that does not correspond to the management plan presented in the permit, they will have to sanction the community with fines, but nothing will happen to the logger. Similarly, if a community is commercializing timber without paying taxes for this activity, they will also receive a fine for not paying taxes.

By 2009, at least two communities have been sanctioned with tax fines but they

did not understand why. During interviews in 2009 people from Puerto Requena were complaining that they have been fined by INRENA, the forestry authority. They claimed that Johnny, the logger, did something wrong and therefore they received the fine. However when the INRENA was asked, they explained that they cannot fine the community. They said that Puerto Requena has a fine but from SUNAT (the national tax authority) for not paying taxes for timber sales. The Puerto Requena people did not know the amount of the fine, and did not know how to pay it. Therefore, what they have done is to keep the logger's tractor hostage in the community. They mentioned during conversations in 2009 that in case they have to pay something to the tax office SUNAT, they will sell Johnny's tractor and pay their taxes.

Box. 2: How to get a forestry use permit by a local community

Kandozi communities, as any other indigenous community in the Amazon need to hold a title before starting extracting timber legally. Each titled community needs a forestry use permit ("permiso de aprovechamiento forestal") to legally cut and commercialize timber. To obtain the forestry permit they need to comply with the following requirements according to the forestry regulations (Forestal and Fauna Law # 27308 from year 2000):

National	**Kandozi case**
Fill out a form soliciting approval for the permit. This implies that an apu or the president of the community has to go to the nearest city where the forestry authority is and request the form and signed it there.	A Kandozi has to go to Yurimaguas. It takes 5 days in average to get there and it is very expensive. Furthermore, since some Kandozi are not proficient in Spanish, they will have to travel with somebody else, increasing the cost of the trip.
Legalized copy of the communal title or any other documentation accrediting legal	This means at least a two-day trip to San Lorenzo and has to include the cost of fuel

ownership of the land. at San Lorenzo. Legalized copy of the minutes of the communal assembly accepting forestry activities. Community members first have to meet, write an agreement and then follow the same process as above to legalize the document. Legalized copy of the letter indicating who represents the community for processing the permit. This step is when the logger often takes advantage of the law. He goes to the community and asks for the original copies of all the documentation he needs. He also make the apu signed a letter giving the logger all the power to represent the community and to proceed with the permit. Copy of the letter with the registration of the communal president in the Public Records. Forestry Management Plan signed by a registered Forestry Engineer or another forester professional registered by the governmental forestry authority, INRENA. This document is based on a forestry	and living expenses The Kandozi will take at least one entire day of work (fish, hunting, chakra, etc.) to meet and discuss the activity. It is the same as in other places of the Amazon. The logger is the one that proceeds with the permit. In this case, the logger goes to Yurimaguas. Usually communities work with the same logger. The Kandozi do not want to be changing loggers, because of the relation that they establish with him. There are only a few that work in the Kandozi territory. The Kandozi has to go to the nearest photocopy machine which is in San Lorenzo. This is the hardest part for a community. Kandozi communities cannot afford to pay a forester and do the inventory. WWF helped one Kandozi community with one forestry inventory and then WWF prepared

inventory and indicates reforestation activities, rotation of extraction areas, quotas, etc. They have to hire a forester to first do an inventory of the communal forest. Then, he/she has to develop the management plan and has to present it to INRENA and wait for comments or approval. This is something the logger typically takes care of.	the management plan. However, they could not use it for the permit, because this community had a problem with its land title.
Copy of the tax registration number of the community.	In most cases, the Kandozi were unaware of this number. So, in the study area the logger offered his help to provide the community with a tax code.
Commitment to pay for forestry fees.	
Receipt of the fee for applying for the permit	The Kandozi reject to pay any fees.

Effects on access to timber

General case. The forestry and fauna law in the Kandozi territory, as well as in other indigenous communities, allows access to timber only to those communities that hold a property title and that have the capacity to comply with requirements for a use permit. But what these legal frameworks are really doing is empowering loggers by giving them the possibility of extracting timber, since they are capable of processing the permits (Ryan 2008). As a result of empowering loggers, the forestry law is promoting unbalanced commercial relationships between local people (Kandozi in this case) and loggers. The logger pays low prices for timber and extracts logs without technical considerations and in great quantities, without investing in reforestation activities as

required by the management plan. This will reduce not only the monetary benefits for the Kandozi from timber extraction, but will reduce access to timber by future generations. In fact, communities that do not hold a title, have to find alternative ways to provide a title to the logger in order for him to get the permit. This has perverse consequences, because the community that will get a fine from the tax service is the one that owns the title and not the one that is extracting timber from its forest.

The Kandozi case. Requirements for commercializing timber are known today as of 2009 by Kandozi communities. They have learned that they have been extracting timber in violation of the law. They have also realized that unfair commercial relationships with loggers have prevented them benefit from timber extraction. Furthermore, they have lost valuable cedar trees and timbered areas that have not been reforested. In consequence, in 2007 all Kandozi communities decided to stop timber extraction until they should be able to regularize their situation with the tax service, with governmental authorities, and until they will be able to comply with requirements of the forestry law. Nonetheless, in 2008 the Kandozi expulsed loggers from their territory and have confiscated loggers' equipment such as tractors, saw mills and machetes. But the Kandozi are uncertain if they will be capable of complying with all of the requirements in the future.

The lack of enforcement of the forestry law in the past years limited Kandozi people to the benefits from timber extraction, by allowing the logger patronage relationships (Box 3). Physical access to timber and access to monetary income from timber extraction were also affected after enforcement of the law, since the law has numerous requirements and as a result loggers still controlled the situation. And finally nowadays (i.e. 2009), the Kandozi are not benefiting with monetary income from timber

extraction because they decided to stop this activity until they can achieve better conditions for themselves. Ironically, these difficulties mean that they are conserving the trees for the future, securing access to trees for them and future generations.

According to the Kandozi, forestry regulations are also restricting access to land. They claim that since timber extraction was promoted in titled communities only, people are less willing to share their land for timber extraction. Consequently for the Kandozi people this law has an effect of reducing access by people who live in a community that does not have a land title. It also strengthens the idea of division of the territory in new communities in order to have its own land for timber extraction.

Box. 3: Johnny Perez, the logger

In the first half of the eighties, the Kandozi started to sell timber to loggers who came from the city of Yurimaguas (Mr. Soplin) or from Chiclin in the Pastaza river (Mr. Augusto Cachay). These two loggers paid very low prices for the cedar and kapok trees' logs that they extracted from the Chapuli area.

In these years, the Kandozi cut the logs by themselves. Each household cut two or three trees, and at the end they add up to about 30 trees per community. All these trees were cut in logs and were prepared for transportation through the river. Once logs were ready to be transported, people from the community called some logger or middlemen from San Lorenzo to sell these logs.

In 2000, the logger Johny Perez started to work in the Kandozi area. He contacted in San Lorenzo with the apu from Limoncocha community, who invited Perez to his community to work on timber. Perez entered this community and started to extract timber with machinery. He had two tractors, chainsaws and operators for these two machineries. Johny Perez agreed with the community of Limoncocha that the price per board foot would be S/. 1.30 soles (it would be US$0.5 approximately in May 2010), but he would

pay the community only 25% of this price because he needed to recover his costs.
Perez finished his work in the Chapuli in 2001 and left the area. However, communities from the Chuinda river, such as Puerto Unguri learnt about Johny Perez and called him to work in their community. Puerto Unguri did the same type of commercial agreement with this logger. Perez in addition, provides the Kandozi credits, fuel, motors, and other goods that the Kandozi solicit to him. However, the Kandozi do not know the real value of all these goods. Thus, when Perez charge the Kandozi for the advanced goods that he gave the Kandozi, they always end up paying higher amounts of money than the real value of these products and the timber extracted.

Fishing legal framework

Two of the fishing decrees that establish fishing procedures in the Amazon, are the fishing law from 1992 (Law # 25977) and the "Reglamento de Ordenamiento Pesquero de la Amazonía Peruana" (Ministerial Resolution R.M. # 147-2001-PE). The fishing law is a national law that regulates marine fisheries (open sea and coastal fisheries) and riverine fisheries in freshwater systems. The Ministerial Resolution (M.R.) on the contrary, includes only specific regulations for fishing in the Peruvian Amazon. Both legal norms promote fishing activities as a sustainable source of food, employment and monetary income for local people in harmony with environmental conservation and optimizing economic benefits. The M.R. establishes the basis for a rational use of resources and the development of sustainable fishing specifically in the Amazon region. It aims to balance economic growth in the Amazon with resource and biodiversity conservation.

Hydrobiological resources according to these decrees and the Constitution are owned by the Nation. Consequently the Peruvian state is in charge of controlling its management and the rational extraction of these resources. But despite national

ownership, the state promotes through the legal framework a wide participation of people in artisanal fishing activities and supports artisanal fishers with capacity building and training courses. Local people are expected to be part of control mechanisms and to help with the implementation of the management plan, one of the requirements of the law. Furthermore, artisanal fishers are required to obtain fishing permit in order to fish in Amazonian rivers or lakes. Requirements and procedures for obtaining that permit are described in the R.M. # 147-2001-PE (See Box 4).

Before 2003, the Kandozi did not follow these procedures. However, with the support of the Fishing Vice-Ministry, the World Wildlife Fund (WWF) and the Research Institute of the Peruvian Amazon (IIAP), 115 Kandozi people were able to complete the process. One hundred and fifteen Kandozi fishermen were accredited by the regional fishing department in 2003, and created their fishing association (called "Yungani") in 2005. Following that, the fishing authority approved a fishing management plan for five species ("boquichico" *Prochilodus nigricans*, "gamitana" *Colossoma macropomum*, "tucunare" *Cichla monoculus*, and "maparate" *Hypopthalmus edentatus*) in Lake Rimachi in 2006, and recognized two surveillance and control committees who operate in two zones of the Lake as part of the plan's implementation.

Fishing regulations procedures

Box. 4: Requirements to obtain a fishing permit (R.M.#147-2001-PE)

Any fisherman in the Amazon needs to comply with the following requirements and procedures in order to obtain a fishing permit and be able to fish in any river or lake of the Amazon basin. The Kandozi has gone through the process of obtaining a fishing

permit between 2003 and 2006.	
General procedure and requirements	The Kandozi process
As a first step, fishers need to be recognized as artisanal fishers by the respective authority. For this recognition, fishers need to attend training sessions given by the fishing authority. This training consists of learning about the legal framework, sustainable practices and control mechanisms.	149 Kandozi fishers were trained by staff from the Fishery Ministry (DIREPRO) in 2003. They went to the Kandozi area and in two workshops trained the fishers. These workshops were organized by CORPI and FECONACADIP and all the costs of the workshops and travel expenses from DIREPRO's staff were covered by WWF.
Once fishers are recognized as artisanal fishers, they have to establish an artisanal fishing association. This association has to approve its statutes in order to agree on how they will operate. Once statues are ready and approved by fishers and the authority, it has to be registered in the Public Records office.	The Kandozi discussed their statues during 2004. They wanted the fishing association to be part of their Federation (FECONA-CADIP). In 2004 statutes were approved by all the Kandozi and the authority and were registered in the Public Records. The entire process was supported by two NGOs, WWF and Racimos de Ungurahui.
As part of this association, fisher members have to create surveillance and control committees, which have also to be recognized and trained by the authority. The fishing state authority delegates fishing control activities to the members of the control committees and they receive a credential, indicating that they represent the	The Kandozi organized themselves into two surveillance and control committees. They decided who was supposed to guard which area and then they communicated their decisions to the authorities. Fishing authorities then trained them in workshops in 2005 and accredited each Kandozi in charge of the control. WWF financially

local authority and have control functions. The artisan fishing association is in charge of developing and implementing the fishing management plan that has to be approved by the fishing state authority. The process of elaborating this document is meant to be participatory and different institutions can help with it. The fishing state authority and its technical arm, also supports the development of the management plan. After the fishing association has an approved management plan, they receive fishing permits and will be able to catch and sale fish.	supported the training and the committees. Several activities oriented towards the development of the management plan took place between 2004 and 2006. Kandozi fishers, FECONACADIP, WWF professionals, fishing authorities and staff from IIAP were involved in the process. The fishing management plan for five fish species of Lake Rimachi was approved in 2006 by respective authorities. In 2006, 115 Kandozi fishers received their fishing permits. However all Kandozi fishers are fishing in Lake Rimachi supported by the Management Plan.

Effects on access to fish

Fishing regulations do affect access to resources to local people, if enforced. As in the case of forest resources, the requirements are difficult to meet, which can limit who can have access to resources under the legal framework. The Kandozi case is the first case in Peru in which an indigenous group followed all the procedures to be recognized as artisanal fishers and the first indigenous group that has a management plan for a lake approved by the respective authority. Elsewhere in the Peruvian Amazon, fishing regulations are not entirely enforced, so its effects on access depend upon the level of implementation of the law. It is worth mentioning however, that if the Kandozi would not have received technical and financial support from other organizations for the

development of the management plan and the fishing permits, they would have not been able to comply with the law.

In the case of the Kandozi, formally only 115 fishermen are part of the Yungani Fishing Association. Thus, only they would have access to fish through fishing permits to fish from Lake Rimachi. However Fishing Vice-Ministry officials who were interviewed in 2009 were aware of the limited capacity that the Kandozi people have to complete the process to obtain fishing permits. They are also aware about their own limited capacity to train more fishers in a remote area such as the Kandozi territory. Consequently they allow all the Kandozi to fish in the Lake Rimachi, if they comply with management plan's restrictions on fish size, fishing gear, mesh size of nets, fishing seasons and fishing zoning. It is not so relevant for the authority if the Kandozi are formally or not part of the Yungani association. Nonetheless, this situation may change if people from the fishing vice-ministry in Loreto change and if they try to strictly enforce the law.

The fishing management plan regulates access to fish by the Kandozi (see Box.5). But it does restrict mestizo fishermen from fishing within the Kandozi territory. The Yungani fishing association only includes Kandozi people and they do not allow mestizos to be part of it. Consequently, mestizo fishers have access to fish only when buying fish from the Kandozi or when the Kandozi authorize mestizos to enter in the lake to fish. This is a beneficial situation for the Kandozi, in that they can control fish resources within the lake and they can restrict access to others.

At present, with exclusive access to fish, the Kandozi have been able to decide how to fish (when, where, how much and what species to fish). With the creation of an artisanal fishing association, the Kandozi had the opportunity to establish a common sale price for their fish and have been able to agree among themselves on better prices for the

fish they sell to mestizo fishers. As a result, the Kandozi have gained greater amounts of cash income from fishing activities in the last years.

Box. 5: Fishing Management Program

The fishing management plan regulates fishing for 4 species. The first section includes information for each of the four species:

a. Boquichico: Identification, morphometric profile, reproduction season, distribution, feeding habits, habitat, size composition, estimated abundance, seasons of abundance and scarcity, previous population statistics
b. Gamitana: Identification, morphometric profile, reproduction season, distribution, feeding habits, habitat, size composition, estimated abundance, seasons of abundance and scarcity, previous population statistics
c. Tucunare: Identification, morphometric profile, reproduction season, distribution, feeding habits, habitat, size composition, estimated abundance, seasons of abundance and scarcity, previous population statistics
d. Maparate: Identification, morphometric profile, reproduction season, distribution, feeding habits, habitat, size composition, estimated abundance, seasons of abundance and scarcity, previous population statistics

The plan regulates fishing through three main management measurements:

a. Establishment of periods of no fishing. This is during spawning time. This measurement restricts fishing during spawning season in the Pastaza channel and other potential spawning areas.
b. Zoning. Based on the knowledge that existed about biology of fish, there has been a zoning of the areas in order to identify critical areas for alevines, and juveniles. There is an additional criteria for zoning and it is the fish destination (fish for subsistence, commercial and reserve lakes)

c. Usage of the appropriate fishing gear depending upon each of the four species. Size of mesh is regulated according the specie.
d. Monitoring of fishing volumes.

Control and surveillance activities are also regulated by the plan. It proposes two control committees for the Kandozi people, who will operate by sectors, one near Musa Karusha and the other in the Huangana area. The plan includes indications of how to operate by the communities.

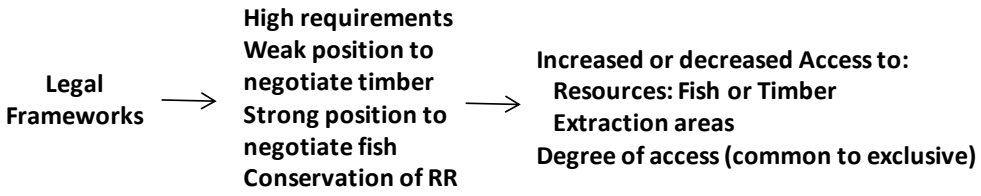
Summary and conclusions

Both the forestry law and the fishing law have numerous requirements that are hard to fulfill for a Kandozi, if they do not have technical and financial support. This lack of capacity of meeting the requirements is the first limitation on access to fish and timber that the Kandozi would have if laws would have been enforced (Figure 5.19). Other studies have shown how legal frameworks can deny access to natural resources (Mbaiwa *et al.* 2008).

Another limitation to access to timber imposed by the forestry law is in relation with land titling. Consequences of this requirement are not only that if a community does not hold a title cannot legally extract timber (Ryan 2008), but place the Kandozi in a weak position to negotiate with loggers. The Kandozi in order to gain access to timber, have to find ways to cut and sell timber and they do it through un-balanced commercial relations with loggers, as happens in other indigenous communities in Peru (Bedoya Garland and Bedoya Silva-Santisteban 2005). This is limiting access to value associated with the timber by the Kandozi because they are not receiving all the benefits from this activity. Now that the Kandozi have stopped the forestry activity they are gaining benefits by guarding their trees, but are not receiving cash income from this activity.

The implementation of the legal fishing framework allowed the Kandozi to organize themselves to auto-control fishing in Lake Rimachi. Furthermore, they can control overexploitation of fish by mestizos. The delegation of control activities to the Kandozi has strengthened the notion of ownership of the Lake Rimachi for them and promoted the involvement of Kandozi in the implementation of the management plan. The delegation of control functions and the enforcement of fishing regulations, have placed the Kandozi in a relatively powerful position, as it has happened in other lake fisheries (Sarch 2001). They can control the area now, determine fish prices and decide who can access to the Lake Rimachi and who cannot. The Kandozi do not own the lake Rimachi, but with the management plan they have secured access to it and have excluded the mestizos from it. The enforcement of fishing regulations is also favoring access to fish by future generations of Kandozi people, because it is preventing overexploitation of the resources by complying with the plan.

Figure 5.19: Legal Frameworks and effects on access to natural resources



5.6. KNOWLEDGE AND ORGANIZATIONS

This section has been named as knowledge, because it explains how different practices, skills, behaviors and levels of organization acquired over time, through various mechanisms, and from a diversity of sources, influences how people gain and maintain access to natural resources. And all of these practices, skills and behaviors are part of the knowledge generation process (Parlee and Berkes 2006). Indigenous people for example,

claim to have the right to control and to access their territories and natural resources because they frequently assert having knowledge and traditions that permit sustainable management of natural resources (Gram 2000). They not only have the knowledge but also the instruments, skills and social relations needed to meet their basic needs and conserve resources. For instance, indigenous people have acquired the knowledge and ability to fish for subsistence. They know what, where and when to fish, according to their needs and according to spatial and temporal heterogeneity of the ecosystem (Pinedo et al. 2002; Seixas and Begossi 1998; Seixas Simao and Berkes 2003; Smith et al. 2002). The same applies to other forest products. Based on their needs, indigenous people will use their knowledge, and technology to cut a tree or to increase fishing intensity as needed (Pinedo et al. 2002; Smith et al. 2002).

Through time, the Kandozi have acquired knowledge about how to better communicate to mestizos, how to exclude mestizos from fishing in Lake Rimachi with the support of fishing authorities, how to access benefits from different organizations, and how to conserve resources for future generations, among others. All of this has been possible because the Kandozi have learned Spanish, have gone through different organization processes and have learned about new fishing technology. In addition, the knowledge they have of their natural environment allowed the Kandozi to perceive changes in resource quantities, which have helped them with decision making processes regarding access and control of resources. They know how resources are dispersed upon their territory, hence they know how to use them spatially from day to day. Throughout the years, the Kandozi have made decisions regarding taking better care of the resources, favoring and securing access to resources for them and for future generations. However, the use of new technology, the introduction of new ways of organizations and knowledge

of the markets not only has generated conflicts among the Kandozi, but it may also have an effect on the sustainability of resources for future generations.

Spanish

The Kandozi people learn Spanish at primary schools. The study area has 19 primary schools, one new secondary school in Musa Karusha and approximately 639 primary students (García Hierro et al. 2008). At the high school level there are 43 students in Musa Karusha and 10 other students at schools outside the territory. Ninety six percent of the teachers are Kandozi and 48% of them have superior education, with the rest Education students. According to data from the Education department, 63% of people between 5 to 20 years old attend primary schools and 7% of the people between 14 and 28 attend high school, and only 4% of the total population will reach the high school level. The rest of the young people do not attend school.

As a consequence of education, the young male and female populations of the Kandozi increasingly learn Spanish. However, Spanish speakers are less in number in the older population. Most of the men older than thirty have a limited understanding of Spanish, and do not feel comfortable to speak; women have a more limited knowledge of Spanish. According to some elderly Kandozi, back in the sixties and seventies only a few of them could speak and understand Spanish.

Spanish knowledge and its effects on access

Access to markets and products. The Kandozi language is a very distinctive language (Surralles 2007). Therefore, the Kandozi felt the need to learn Spanish when they started to commercialize game and fish back in the fifties and sixties. A mestizo trader of 75 years old was interviewed for this research and he mentioned that after so

many years of buying products from the Kandozi he ended up learning their language. During his first years in the Kandozi territory, he struggled to communicate. Thereafter he made the effort to learn key words to buy Kandozi products. But little by little the Kandozi started to learn Spanish as well and they could communicate using a mixture of both languages. He does not remember when they started to speak Spanish. But he does remember that it was easier for mestizos and for Kandozi to buy and sell products when they could communicate in Spanish. Access to markets to sell fish and timber, as well as other products has been facilitated to the Kandozi that speak and understand Spanish.

When the Kandozi learned Spanish, they have also learned more about the markets (for fish and timber), real prices and also how to negotiate with mestizos. This has benefited indigenous people with less unfair trade agreements with mestizos for fish and timber, and with more gains from both activities.

One story told by an elderly Kandozi named Pablo (fictitious name) shows how important Spanish was to gain access to resources. He portrayed how he could evade governmental and military control in Lake Rimachi and take his products to sell in San Lorenzo. He argued that it was difficult to commercialize game, fish and animal skin when the Lake Rimachi was under military control in the fifties. Guards did not allow the Kandozi to transport any product to sell and would seize the boats and products from the Kandozi. Consequently, they feared going to Ullpayacu or San Lorenzo to sell their merchandise. The only way the Kandozi could go to a town was during the night, hiding from guards, but being exposed to other dangers.

Pablo explained what happened one time when he had enough products to go to San Lorenzo to sell them. He was young at the time and did not have a boat, so he had to ask his relatives to lend him one. They were scared of losing the boat but they agreed to

give it to him because Pablo was sure that he would be able to cross Lake Rimachi without being caught by military guards. He was transporting paiche, peccary skin, turtles and other products to sell, when he was caught by the guards. But because he spoke Spanish, he could explain to the guards that he needed money to buy basic things at San Lorenzo, such as batteries, lamps, knives, and clothing. Pablo negotiated with the guards and gave them a few pieces of paiche, and he told them that he would show them everything he bought on his way back. He was very proud when telling the story, because he was the first Kandozi -according to him- who had gone to San Lorenzo to sell products and make it back to his community without troubles. He was sure that without knowledge of Spanish it would have been impossible for him to explain all this to the guards. So in this case, Pablo gained access to resources because of his knowledge of Spanish.

Access to other benefits. People from Ullpayacu, the closest mestizo town from the Kandozi territory explained how at present they can see and talk with many Kandozi that go to Ullpayacu to attend school, to sell and buy different products, to receive medical care, or to talk to municipal authorities. The Kandozi people sometimes only fish a small quantity or collect a few fruits to change it for fuel for their boats to get to Ullpayacu or San Lorenzo. In these and other towns, they can acquire to health services, education or other benefits only if they are able to express their needs in Spanish.

Conflict resolution. Conflicts between Kandozi fishers and fishers from Ullpayacu have always existed. Mestizo fishers were interviewed in 2009 and they accepted that they have continuous conflicts with the Kandozi because of reasons related to fishing. But since the Kandozi started to understand Spanish, better mechanisms have been used to solve these conflicts. Conflicts have occasionally turned violent. Thus, the police or regional authorities had to intervene to calm violent situations or solve some of

the contestations. Conflicts over access to fish and timber have been eventually solved thanks to the ability of communication among authorities, mestizos and Kandozi.

Organizations

Indigenous federations, such as AIDESEP (the national indigenous organization), CORPI (the regional indigenous organization) and several other local federations representing different indigenous groups from the Peruvian Amazon have been receiving technical and financial assistance from national and international organizations to improve access to land and to resources. More specifically, the Kandozi have received additional political support from AIDESEP, CORPI and FECONACADIP for the community titling process, which aimed to help them in securing access to natural resources as explained in previous chapters. AIDESEP and CORPI also assisted the Kandozi with legal support when they took control of Lake Rimachi, helping the Kandozi to exclude others from fishing in the Lake Rimachi for three years.

The Kandozi have gone through different organization processes promoted by themselves or by others. AIDESEP helped the Kandozi to establish FECONACADIP, one of the Kandozi organizations that represent Kandozi communities. The Kandozi also have self-organized for controlling timber extraction and for recovering control of Lake Rimachi; and they have been assisted to create the fishing organization called Yungani. In order to make these organizational transformations, the Kandozi have been interacting with several levels of organizations (international, national, regional) and have been learning from them. This process has been complex and it took a long time. The following section explains how and why the Kandozi started to organize and how they gained support from other organizational levels.

Indigenous Organization processes

This section is based mainly on an interview done in 2009 with an ex-president of AIDESEP (whose name cannot be revealed). It provides quality information about how the Kandozi people saw the indigenous organizations as a way to gain access to and control of resources.

AIDESEP was founded in 1980 as the result of the decision of three local indigenous federations of the Peruvian Amazon to constitute a national organization. These three groups were isolated in making claims for territories, well-being and identity. They decided to have a national organization that would represent all indigenous groups in the Amazon. This was also influenced by a worldwide indigenous movement that was claiming for the vindication of their land. (See Box 6 for an example of the vindication process and the role of local, regional and national indigenous organizations).

Yungani artisanal fishing organization. In 2003, the Kandozi started an organizational process to control and secure access to fish from Lake Rimachi. But this time they were guided by NGOs (WWF and Racimos de Ungurahui) and followed the fishing legal framework requirements. It was not a self-organization process. One of the main differences with the process in 1991 is that in this case a Kandozi leader was not the one fostering the creation of Yungani. Other non-Kandozi people were involved in the process and although the Kandozi were part of it, they received external financial and technical support to create Yungani and the control committees. During interviews in 2009, the Kandozi people mentioned that if they would not have received this support, they would not have created Yungani, because it was something new for them.

The Yungani fishing organization has to follow guidelines from the management plan and from the fishing law. Thus, the way they organized the control committees and

the fishing activities needed to meet these requirements. Although the Kandozi fishers participated in the entire process of the fishing organization and were willing to do it, it was not an initiative that started among them. It was something brought from outsiders into the area that at the beginning was operating satisfactorily for most of the Kandozi, according to interviews in 2009. However, after four years approximately of Yungani creation, conflicts originated among the Kandozi people.

During interviews and informal conversations in 2009, several Kandozi complained about the way Yungani, its representatives, and the control committees were operating at that time. The Kandozi explained how Yungani authorities did not enforce the management plan regulations and other internal agreements regarding fishing guidelines. Not even Yungani representatives comply with these regulations. In addition and according the Kandozi fishers, members of the control committees were not willing to control access to fish within Lake Rimachi. Some of the control committee members that were interviewed accepted that they did not want to control fish resources and did not want to enforce fishing regulations because they were not receiving enough support from WWF (they were referring to fuel), from their own communal authorities and from FECONACADIP's president, who reneged on fishing rules. Only a few people respected Yungani's president and committees' members. One of the complaints was that Yungani's president did not have the authority among the Kandozi and the mestizos to be able to enforce fishing regulations.

Box. 6: A Kandozi case of self-organization

AIDESEP in the late eighties was training indigenous leaders on issues about territory, organization, and land demarcation, among others. This resulted in a set of meetings in

San Lorenzo with representatives from different indigenous groups, including the Kandozi. The first general meeting for several indigenous groups from the northwestern Amazon was in 1987 in San Lorenzo. The goal was to organize these groups and create indigenous federations. A Kandozi leader participated in this meeting. He used this reunion as an opportunity to express to other indigenous people his concern about fishing resources from Lake Rimachi. It was in this meeting in 1987 when AIDESEP's leaders listened for the first time a Kandozi complaining from fishing authorities (called *pesquería)*. The Kandozi leader was explaining other representatives that *pesquería* was depleting the lake by letting mestizos fishers to enter and fish within Lake Rimachi.

But it was by 1990, after FECONACADIP was created, that its president gave a letter to AIDESEP accusing officials from the Fishing Ministry to be depleting Lake Rimachi. This was done during a general meeting in Lima with AIDESEP representatives from the entire Peruvian Amazon. The Kandozi argued in the letter that the Rimachi did not resemble a fishery reserve as it was supposed to be (since 1945 Lake Rimachi was declared a fishery reserve). Instead, Lake Rimachi looks like drinking water, trying to explain that it was as clean as drinking water without any fish. Thus, the Kandozi people were highly concern about the recovery of lake's control. So, Sundi Simon was elected as FECONACADIP's president by all of the Kandozi apus and he designed a strategy for taking back the control of the lake.

During those times, the Kandozi people were united. They did not have conflicts at the organizational level and they had a clear goal as an organization which was to recover Lake Rimachi. For the interviewee,

"los Kandozi eran vírgenes en temas organizativos y había mucha algarabía por la nueva organización y por la idea de auto demarcación de su territorio y reivindicación territorial. Esto también fue aprovechado por Sundi para organizar la toma del lago" (The Kandozi were virgins in regards of organizational issues and there was a lot of joy due to the new organization and for the idea of land demarcation and revindication. This was also used by Sundi to organize the control of the lake).

CORPI, AIDESEP and other organizations, such as the religious organization "Madres del Sagrario" gave the Kandozi support. The list of organization and people that supported the takeover of the lake cannot be given because they supported it with a low profile. This event took place during the Shining Path times, and an event like this could have been interpreted by the government as a terrorist attack. Therefore all the supporters tried to be very careful and the names will remain here anonymous. AIDESEP's lawyers assisted the Kandozi with legal advice and requested them to have a non-violent encounter.

CORPI and AIDESEP had a role of facilitator between the state and the Kandozi. The state could not reach the area because of its remoteness, so they did not know in detailed what happened. Consequently, both regional and national organizations helped the Kandozi by explaining to the government what really happened at Lake Rimachi. Sociologists, anthropologist and lawyers helped CORPI and FECONACADIP to write documents explaining the events and helped the Kandozi in writing their position in regards of controlling access to the lake. The Kandozi also used other organizational levels and published their position in newspapers.

Months after the takeover, the Kandozi and CORPI organized a meeting in Musa Karusha with the participation of all the Kandozi, and other professionals that supported them. In this meeting they decided how to organize themselves to control the lake and founded a new community at the entrance of the lake, Musa Karusha. This meeting was critical for defining present and future access to Lake Rimachi. AIDESEP helped the Kandozi to spread the word that the Kandozi were taking control of the lake in order to recover fish stocks for their livelihoods. After all this support, the Kandozi felt that they had a strengthened organization, ready to interact to different of organizations at different levels.

The interviewee was asked why it took so long for the Kandozi to react. Lake Rimachi was under state control for more than 40 years. He argues that there were several factors that made the Kandozi react tardily but at the end takeover the lake. One of the

reasons they did not react before, was the limited knowledge about their rights to the land and to resources as an indigenous group. In addition, they were unaware of the possibilities they have as an organization to act together in order to control their resources. They also ignored the legal fishing framework that promoted their participation in guarding natural resources. However, they reacted and took control of the lake. During the 1980s and 1990s, land vindication processes were taken place around the world and this was one of the triggers for self organization. Another stimulus the Kandozi had was all the organizational capacity building activities imparted by AIDESEP to FECONACADIP. Furthermore, all the Kandozi felt that Lake Rimachi was theirs and that the state was depleting their resources that sustained their livelihoods. As explained in previous sections, the Kandozi also have self-organized to halt timber extraction, after learning about the legal framework and after realizing that they could have greater benefits from this activity.

The interviewee also talked about current problems of the Kandozi federation. He thinks that current divisions are because "they have lost their vision", which means they have lost their ability to see their future path. He argues that young people do not realize the magnitude of the changes they have to face, such as markets, globalization, capitalism, among others. He said that they want to keep their traditions without adapting to changes. He claims that FECONACADIP was separated in two federations mainly because of the split of the two Kandozi couple (case that was explained in the kinship section). For him, kinship is important and it was a past strategy for solving wars among them, but he thinks that now indigenous people have to face other less-known impacts and they need to be united. The current political context, in which the state and large companies want to have access to indigenous lands and resources, place a series of difficulties to the Kandozi. These difficulties cannot be faced or resolved if they are divided. The interviewee thinks that there is a general lack of leadership among the Kandozi people.

Organization and Access

Kandozi organizations. Through self-organizational processes the Kandozi were capable of recovering control and access to their main source of fish. Before they took over the lake in 1991, they had limited access to fish from Lake Rimachi. But for three years they limited fishing activities in Lake Rimachi, benefiting from recovery of fishing stocks.

Once they recuperated control of the lake and the fishing stocks, organization for fishing was weak or absent. Nobody regulated fishing quotas, gear, zones or the extraction of fish during spawning. They were able to commercialize fish, but the commercial relationships with *patrones* and mestizo fishers did not allowed them to access all the benefits from this activity. They could not control prices and volumes. After they were organized as a fishing organization, at the beginning they could gain access to fish by excluding mestizos and by controlling fishing activities. In this case, a fishing organization helped them to secure access to fish. It also helped them to access to better prices and receive greater benefits.

Community organization. As explained in Chapter three, communities follow certain guidelines for organization. The way in which communities are organized influences the decision making process. Each community has an apu, a president and other authorities. However, this way of organizing is relatively new for the Kandozi and it has had an effect on how decisions regarding access to resources are made. At the community level at present, the apu of the community has the power and the authority to decide who else from other community can have access to resources from his community. In addition, community organization has contributed to empowering apus or communal authorities to limit or to favor access to community members, as in the case of timber

extraction in which communities have decided to halt this activity.

Non-governmental organizations. Increasingly the Kandozi have been using other organizational levels to gain access to resources. They learned how to work with international non-governmental organizations, in order to obtain support to manage fish from Lake Rimachi. They asked for technical and financial support from WWF in order to conserve fish and timber and improve management. This relationship started in 2002 and was directly oriented to conserve resources and improve the benefits from the use of fish and timber.

Governmental organizations. The Kandozi also have learned how to use local and regional authorities for their benefit. They have recently established a relationship with the regional fishing authority (DIREPRO) in order to help with controlling the implementation of the management plan of the Lake Rimachi. The DIREPRO has delegated control responsibility to Kandozi fishermen. But at the same time DIREPRO has been helping the Kandozi in supervising fishing activities, especially during spawning season. With this relationship the Kandozi are more empowered to make decisions regarding who has access to fish. They have been excluding mestizos from fishing in the Lake.

As FECONACADIP, the Kandozi have been able to title more communities. Being a federation has given them more political power to support apus and ask for titles. This has given the communities the possibility of delimiting timber areas. FECONACADIP has become their political representative. With the support of FECONACADIP, the Kandozi have found another way to solve access conflicts between the Kandozi and mestizos from Ullpayacu and San Lorenzo, who fish and extract timber form the Kandozi territory.

Technological knowledge

Fishing technologies

In the last 50 years, the Kandozi people have experienced a dramatic change in their fishing technologies. This section is based on both unpublished reports (Bodmer et al. 2005; Escobedo and Moya 2004) and interviews done with the Kandozi for this research in 2009. According to the Kandozi, they learned how to use fishing nets and other more intensive fishing gear beginning in 1956, when a mestizo fisherman first visited Lake Rimachi. Before fisherman Pedro Tuesta went to Lake Rimachi, the Kandozi people used to build their own fishing gears, using materials from the area.

Kandozi fishers select the type of gear to use, according to the season, the species that they want to fish and where is located, and depending upon if it is for subsistence or commercial use. Before Pedro Tuesta arrived, they not only did not use nets, but commercial fishing was very limited. Tuesta was the first mestizo who entered the Kandozi area with other mestizo people to fish. He asked the Kandozi fishers to fish for him. So, the Kandozi sold the fish to Tuesta and he took the product to sell it in the cities. Consequently, he increased the demand for fish in the area, especially for paiche, gamitana, paco and other large species that have a high value in the market. However, sometimes he did not pay the Kandozi with money. Tuesta instead gave the Kandozi merchandise in exchange for fish. He bought different low value products in the markets that were attractive to the Kandozi and sold (bartered) them to the Kandozi at higher prices. This situation is common elsewhere in the Amazon (Gow 1991).

Fishing gear used by the Kandozi can be grouped by types. The Kandozi's fishing gear includes harpoons, lance and arrows (projectiles), nets and gill nets, and different types of hook type gear known as "volantin", "barandilla", "kamorin" and "mangasi"

(these names are in Kandozi) (Illustration 18). Communities in the upper part of the basin also employ toxic plants (called masui in Kandozi and huaca in Spanish) to fish in small streams, although only for subsistence. The Kandozi have commonly used projectile and hooked-type of fishing gear. But more recent, they have additionally started to use nets - especially the ones with a bigger mesh (Table 5.7). The use of nets responds to the need to meet greater demands for fish. So, fishing gear that can be found today is a mixture of traditional technology (for small volumes of catch) and fishing nets that allow the Kandozi to catch larger quantities of fish.

For transportation from a community to the fishing grounds, they use wood canoes approximately 4 meters long, made of a single tree. But with the entrance of mestizos in the area, and because they have to transport larger quantities of fish for commercial purposes, they have started to use wood canoes of approximately 10 to 12 meters long of size with engines from 10 to 16 hp known as “peque peque” (Bodmer et al. 2005). So, with the entrance of commercial fishing not only fish have more pressure today, but also cedar and other species of trees for canoes, and there is an increasingly need to earn money to be able to buy the engines and the fuel for it.

Illustration 18: Fishing gear

Volantín

Arrow

Barandilla

Mangasi

(Pictures from Luis Moya)

Table 5.7: The Kandozi's fishing techniques

Fishing gear	Description	Species fished
Harpoon or lance	It is a long wooden stick with an iron tip that kills the fish. This is tied to a nylon string that is activated from the canoe.	paiche, gamitana, paco.
Arrow	Locally made arrow. The arrow is operated from the canoe.	boquichico, tucunare, acarahuazu, yaraqui
Volantin	This is a nylon string mono or multifilament of approximately 20 meters long. This is attached to a stick made of balsa wood, which floats. Tied to one end is a hook (number 2 or 3). This can be operated from a canoe or from the shore of the river or lake.	corvina, tucunare, paña, doncella, peje torres.
Barandilla	This is a 3 meters long nylon string attached to a thin but resistant stick. On the other end the nylon has a hook (which can be number 10, 12 or 14). Can be operated from the shore or from a boat.	sardina, shuyo, fasaco, paña, pequeños bagres.
Kamorin	This is a 1.5 meters long of multifilament nylon number 30. This is attached to a piece of topa wood of 40 cm long that allows it to float. On the other end the nylon has a hook (number 8). This is taken by fishers to the center of a lake and left there between 6am and noon and between 3 to 6pm. They use other small fish as bait. This tool is used to fish big paiches and other large fish. By using several Kamorin at the same time, they can capture fish for commercial purposes, especially paiche.	paiche, doncella, y peje torre de gran tamaño.
Mangasi	Made of one multifilament nylon number 36 of two meters long. A hook (number 1 or 3) is tied to one end. It is operated by a fisher from the canoe, but near the shore of the lake or within a "tahuampa" (the flooded forest). The fishermen tie the Mangasi to the vegetation that is underwater, leaving the nylon 50 cm below the water. This gear is used during the night.	Paiche, and two species of caiman.

Nylon Net (multifilament)	This consists of one or more pieces of nets. Generally with a mesh size of 3 to 4.5 inches and includes floats and string. It is operated from a person from his canoe.	boquichico, yaraqui, corvina, arahuana, paña, acarahuazu.
Nylon Net (monofilament)	This is especially employed during fish spawning season. The difference between this net and the multifilament is that this one has a greater number of floats at the bottom of it. It is operated from a canoe, attaching one end of the net to a steam of a plant called rayamandi.	boquichico, yaraqui, corvina, arahuana, paña, acarahuazu (probably all of them with eggs).
Gill net	This net can have a mesh of 4" made with nylon number 3 or 6, although some people prefer to use monofilament of 6x4", especially during spawning season.	Boquichico in particular.

Mestizo fishermen use a variety of nets that allow them to fish in larger quantities and for more valuable fish than the Kandozi. Some of their fishing gear includes "hondera" nets with a mesh of 6x2", 6x3", 6x3.5" and made usually with 8 to 10 pieces of net of 100 meters long each piece. They also have gill nets of 6x4" of mesh and sizes between 80 to 100 meters long and 8.5 meters high. The Kandozi have been observing this way of fishing by mestizos and in the last three to four years, they have been buying more nets to fish large commercial quantities of fish. Chapter six shows how the Kandozi spend an important part of their income in buying more fishing gear. This will result in a greater pressure of fishing which could potentially lead to overfishing.

Over the years, the Kandozi have learned new ways of extracting resources. They mentioned during interviews in 2009 to not remember when they started to use salt to preserve fish, but they do remember that once they learned how to preserve fish with salt, they could fish larger quantities of fish and sell them to mestizo fishers. With salt they could take their catch to Ullpayacu or San Lorenzo, where they could receive better prices for their products.

Timber technologies

The Kandozi people use axes to cut trees. Trees are transported to the community or to the river by pulling them with ropes made of palm fiber. The Kandozi usually organize mingas to cut and transport trees, as a way of helping each other with this task. However, when they cut trees for the logger, he gives the Kandozi sawmills for cutting tress and tractors to transporting the logs. So, the Kandozi have introduced to the area more intensive technology to extract timber from the forest.

Similarly to fishing, when the Kandozi learned how to cut trees with sawmills (usually owned by the logger) they were able to cut more trees in less time and had to invest fewer work days in cutting logs

Technology and access

On one hand, technology has favored access to fish and timber by the Kandozi. New technology allows the Kandozi to have greater capacity of selling larger quantities of fish and timber in less time and with less effort. However, the effects on resources have not been evaluated. On the other hand, access has also been reduced because there are fewer resources available. The Kandozi mentioned in 2009 that they have perceived how resources have declined, but it is unknown how much the use of the new technology has caused this decline.

The effect of the use of technology on access is not equal to all the Kandozi. Kandozi fishermen that cannot afford to buy new technology or who do not know how to use nets, cannot catch larger amounts of fish by themselves. They have to find other alternatives to fish larger volumes. The same with timber; if a community does not have a tractor or sawmill, they will have to invest more effort and time to cut trees for the logger.

Perception of Resource Abundance

Depending upon age, proximity to mestizo towns, and community location, Kandozi people had different perceptions concerning resource abundance. In 2004 I asked a group of young Kandozi men (in their twenties) about timber and why they were cutting trees without any management consideration and selling for very low prices to loggers. They aswered it was because "they had a lot of timber and will not finish it." Elderly Kandozi on the contrary felt that they had fewer trees than in past years. Five years later people (young and old) did not feel the same. More and more people expressed their concern about resource deprivation during conversations in 2009.

In some communities, such as Nueva Yarina and Huambracocha, they felt that there are fewer fish than before, but they did not have the same perception about timber. But in 2009 they explained how they have to walk for more hours to find a cedar tree or a big enough tree for a canoe. Thus, they are now feeling or perceiving a resource decline in timber quality and availability. This perception is not restricted to elderly Kandozi but also occurred among young people. As a consequence of resource decline perception, Kandozi mentioned in 2009 that they have decided to halt timber extraction. They have realized that they had to do something with timber in order to avoid its decline.

Decisions related to resource abundance perceptions and its effects on access

Since the Kandozi have realized that resources can terminate, especially timber, they have been making decisions about its use. For example, since 2008 they have stopped extracting timber and conserve the trees for non-commercial use. The Kandozi are conserving the trees for future access and for coming generations. Although this situation may be temporary, they have said that they will wait for better conditions to extract timber, which means they are trying to manage the resource in a more sustainable

way.

Decisions regarding fish have not included cancelling the activity as was the case with timber. Part of the motivation for controlling fish activities in 1991 and accepting the formation of the Yungani fishing association is because they perceived that fish stocks were declining. They also know that if they do not take care of these populations, they will lose their primary source of income and protein. Therefore, since 1990 they have made decisions about fishing seasons, materials and species. These have had an effect on access to more fish, better prices and zoning of the Lake Rimachi, which in turn led to improving benefits from fishing and conserving the resource for the future.

Present use of fish and timber then, will be affected in part by how much the Kandozi feel the resource is declining. They expressed during interviews in 2009 that they will halt timber extraction until they meet several conditions (previous chapter). But it is worth mentioning that all of the communities that have halted timber extraction plan to cut trees and sell them in the future. For fishing, the situation is more complex because it is more difficult to self-regulate this activity. The Kandozi's perception on fish decline is generalized among them. Nevertheless, despite all the agreements made by the Kandozi to manage Lake Rimachi's fisheries, they have been making fishing contracts with mestizos. Consequently, the Kandozi with a contract has been gaining personal benefits but affecting access to fish by other Kandozi people.

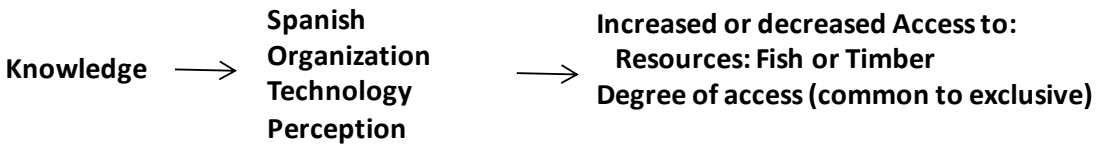
Summary and conclusions

The Kandozi can both gain and lose access to resources depending upon how they use their knowledge and how they use their organizations. For example, the Kandozi have gained access to fish and timber by learning Spanish, because they have been used to access markets, to solve conflicts and have learned new extractive technology and

ways to be organized. Technology has helped them in extracting more resources in less time and has been able to extract more valuable fish. Organizations have allowed them to exclude mestizos from fishing from Lake Rimachi and have given the Kandozi the authority to control their territory. In addition, with all these elements, they have also been able to solve conflicts with mestizos. With the support of different organizations, they have been using different organizational levels to access to financial and technical support, what has also helped with gaining access to resources. Knowledge about management guidelines had favored that the Kandozi take care of fish and timber for future generations. Environmental knowledge has been also important to gain access to fishing grounds, different types of species or to forestry areas.

But the Kandozi can also lose access to resources due to organizations and knowledge (Figure 5.20). Not everybody has access to knowledge equally. Thus, only those who can speak Spanish, or have had the opportunity to develop management technologies, or have been part of an organization such as Yungani, or is capable of acquiring fishing and timber gear, would have more access to resources than others. Knowledge can be used to empower only a few who can use it to exclude others from having access to resources. For example, control committee members of the fishing association have the power to exclude others from fishing and can take this position as an advantage for a member to have more access to fish and benefits than others. Yungani, according to the Kandozi in 2009, have concentrated the power and access to resources to a few Kandozi and the rest of the fishers were not receiving benefits from this organization.

Figure 5.20: Factors shaping access to natural resources related to knowledge



5.7. DISCUSSION ON THE FACTORS THAT SHAPE ACCESS TO FISH AND TIMBER

The question about the factors that shape access to resources has been answered in previous sections, by describing one by one each factor that shapes access to fish and timber in the Kandozi territory. All these factors have been subject of study of other authors too (Table 1.1). However, these factors are in fact intertwined and operate in conjunction with each other (Ostrom 2007; Ostrom et al. 2007). But most of the studies about access focus either on a few factors (Mbaiwa *et al.* 2008), on only one resource (McSweeney 2004, 2005) or analyze access by a single user (Sarch 2001; Sarkar 2008). Therefore, it is difficult to understand the process through which people have access to fish and timber, if this process is not analyzed as a complex system of natural resource management (Dolšak and Ostrom 2003; Van Laerhoven and Ostrom 2007).

Literature stresses the need of using frameworks that address the intricacy of the systems, by analyzing issues of scale, history, multiple resources and resource users, uncertainty, rules of access, legal frameworks, knowledge, the nature of the resource, among others (Adger et al. 2005; Berkes 2006; Cash et al. 2006; Ostrom 2007; Van Laerhoven and Ostrom 2007). Furthermore, for a better understanding of complex systems, it is important to consider these issues as processes that are in constant change and evolution, responding to external and internal forces to the system (Sarch 2001; Sarkar 2008). Nevertheless, this section discusses the intertwined factors that shape access to timber and fish by the Kandozi, but as they occur nowadays (that is as of 2009).

The historical evolution will be discussed in Chapter seven, in relation to the sustainability of the socio-ecological system.

This discussion of access to fish and timber further below draws from other studies on access that consider the notion of benefits (McGrath et al. 1993; McSweeney 2004; Ribot and Peluso 2003), and from geography studies that propose the spatiality of natural resource use (Butt 2010; Martin 2001; Pyhälä *et al.* 2006; Roth 2009). Following McSweeney's work especially, analysis of access to commercial fishing and timber are divided in terms of access to the resource (fish or timber), to the extraction areas (fishing grounds or forest areas) and to the market. This division is useful for this study, because it contributes with better understanding of the spatiality of access and to understandings of how the people can have access to monetary benefits through the market. The factors shaping access are common to these three dimensions; however, they operate and relate in different ways in each case (Figure 5.1).

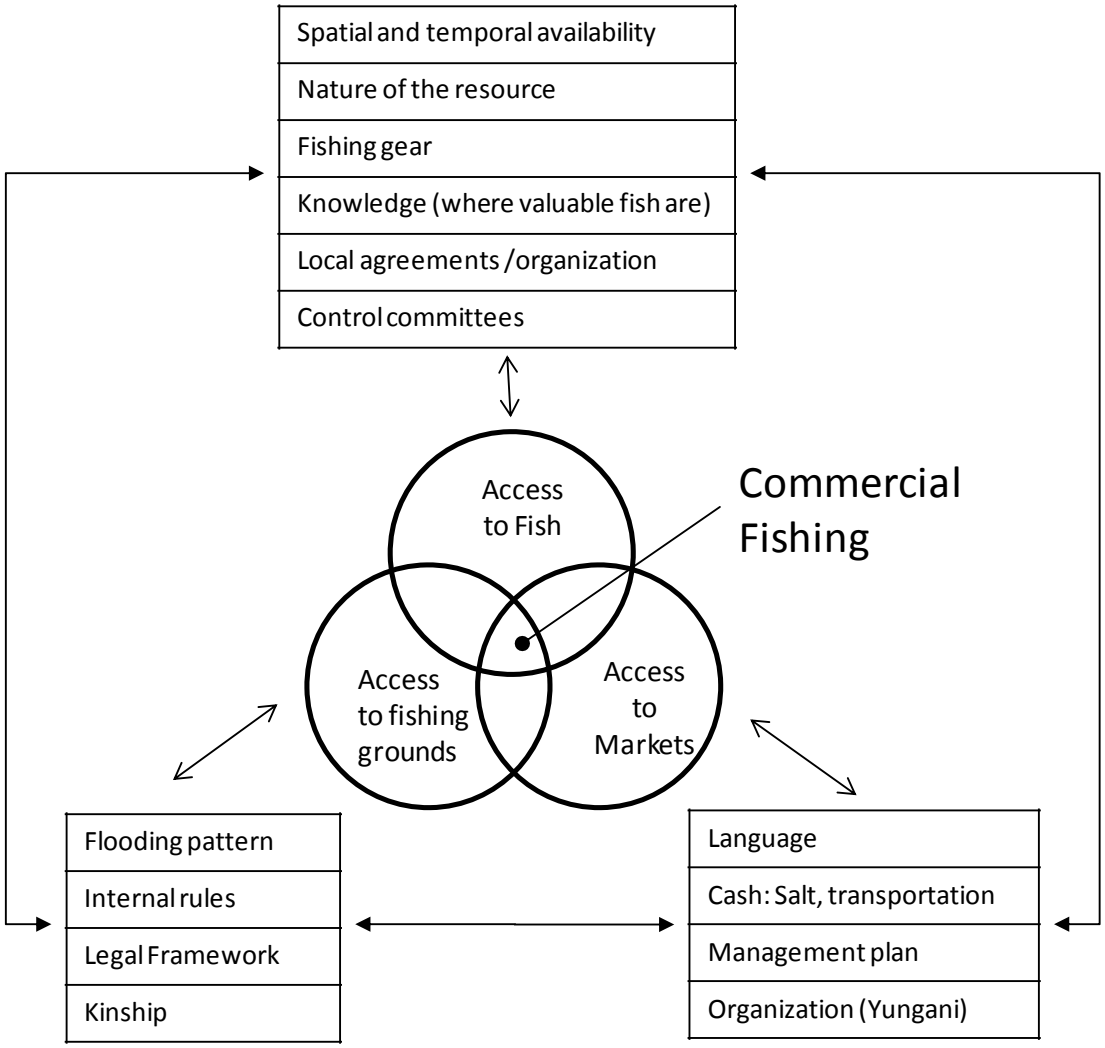
Contemporary access to commercial fishing

Fish are physically available depending upon environmental dynamics. If assuming that commercially valuable fish species are available, then the Kandozi will have access to them based on their knowledge of location of fish. They also need to have the appropriate gear and knowledge to be able to catch fish. Rules regarding fishing seasons and zones are in place (local agreements and in the management plan, see Chapter Five), and there are also rules regarding which species can be captured. For example, paiche cannot be caught if it is less than 1.6 meters long or during breeding season, or people cannot fish in spawning areas of boquichico. So, if they comply with these and other rules (and members of the control committee have the power to enforce these rules), the Kandozi fishers will have restricted access to certain fish or during

certain times of the years. In addition, only the Kandozi have the right to access fish, because mestizos have been excluded by the Kandozi as a group, with the support of the management plan, unless individual Kandozi make contracts with them. All this is possible in areas surrounding Lake Rimachi, where the Kandozi are entitled to have fishing camps, but not the mestizo people. All these factors are depicted in Figure 5.21.

But there are fishing grounds subject to certain rules that restrict access to fish in those grounds. Kandozi communities (not individuals) have exclusive rights to some fishing grounds, such as Huambracocha and Union. This resembles fishing territories as mentioned in other studies (Berkes and Seixas 2005; Seixas and Begossi 1998), where ownership of these territories may depend on fishing gear. Some gear such as gillnets can be used in fishing territories with certain physical characteristics (Seixas and Begossi 1998). In this case, territoriality will depend on rules regarding community land tenure, proximity, community ascription, and powerful relations, as explained in previous sections of this chapter. In addition, there are some small lakes that are of exclusive access to a kin group of communities, such as Pirumba cocha. Differently from the case of Sepetiba Bay in Brazil (Seixas and Begossi 1998), where territoriality is at the level of communities, in this case territoriality can be at the communal level, at the level of kin group of communities or at the Kandozi territory level, where mestizos are excluded.

Figure 5.21: Factors shaping access to commercial fish



Fishing grounds, such as fishing camps in the Rimachi area, need also to be accessible and this depends upon the environmental dynamics, for example with the hydrological regime. Environmental, social dynamics and needs of each fisherman determine the length and the period of time that fishermen have access to fishing

campgrounds in the Rimachi area.

The process of governing access to commercial fishing is not complete if benefits, such as cash income, are not delivered to the Kandozi. Through the commercialization of fish, the Kandozi receive cash income or merchandise from the mestizos. In order to sell their fish, the Kandozi first have to preserve it. The fish needs to be dried and salted, and for that fishers need to acquire salt and know how to use it. Then, they have to be able to transport the fish to the middlemen, either by canoe or motor boats. Through social networks and the Yungani organization, they decide the price for their fish, which put them in a powerful position to negotiate with mestizos. They also need to be able to communicate with mestizos in Spanish. In theory only fishermen who are part of Yungani can commercialize fish (however this was not enforced in 2009). Another way to obtain cash is through contracts with mestizos. But under this arrangement, resources are affected because it is impossible to control how much mestizos exploit fish stocks. Mestizos argue that they have a permit to fish granted by a Kandozi and they can fish as much as the contract says.

As seen above, access to commercial fishing is mediated by environmental, social, cultural and political mechanisms (Figure 5.21). In theory, the Kandozi govern access to commercial fishing only through the mechanisms and rules established by the Yungani artisanal fishing organization. Yungani responds to the fishing law, to local rules of access and to the dynamic characteristics of the environment and the nature of the resource. Management arrays and rules of access to fish are supposedly enforced by the Kandozi control committees of Yungani, who share control responsibilities with governmental authorities, as occurs in other places (Gadgil et al. 2003). But in practice, the present (2009) enforcement of the fishing management plan has been limited and

contemporary access to fish has been challenged by elements such as power relations, kinship relations, market knowledge and market demands, among others. This has resulted in unequal access and hence in management conflicts among the Kandozi and between them and mestizos, leading to a more complex conceptualization.

Challenges and conflicts of governing access to commercial fishing

Multi-specific. Commercial fishing is based on more than 20 species of fish (see Table 2.3 in Chapter Two). So, when it says access to fish in the model (Figure 5.21), it is actually referring not to one single species, but to a variety of fish species that are commercialized. This is a general situation in fisheries. It is uncommon to find a fishery based on single species (Charles 2001; Martin 2001), especially in flooded areas where fish availability will depend on flooding regimes, among other factors (McGrath *et al.* 1993; Pinedo *et al.* 2002; Sarch 2001; Thomas 1996). In addition, this type of fisheries is complex because the control of mobile and migratory species demands considerable effort and costs and its management also demands more complex arrangements (Adger et al. 2005; Begossi 2001; Dolšak and Ostrom 2003; Hanna 2003). The Kandozi have rules of access for a few species, such as paiche and arahuana, but they do not regulate the migratory boquichico. So, if a Kandozi wants to fish paiche for example, he will need to have the appropriate gear, have the knowledge to use it, and he also needs to know the habitat for paiche and the season when he can have access to fish. Other rules of access for particular species are developed in the management plan.

Management plan. The fishing management plan only regulates fishing activities of four species (maparate, boquichico, paiche, gamitana) commercialized by the Kandozi. Therefore, management of the rest of the commercially utilized fish is in limbo. Most of the regulations in the plan are in relation to these four species within Lake Rimachi (see

Box.5). Only a few rules relate to zoning within the Lake Rimachi and commercialization issues, but again it regulates only for one area and not for all fishing grounds. Furthermore, it considers legal fishermen only those who are part of Yungani and only a few Kandozi have the responsibility of control access to fish (members of control committees). So, this plan faces several challenges that many other resource management programs face (Berkes 2006; Cash et al. 2006).

Mismatch of scale. One challenge is the mismatch that exists between the scale at which the fishing management plan regulates access to fish, and the biophysical and ecological characteristics of fishing grounds of the Kandozi territory and its resources. As demonstrated by other studies, it is critical to determine the scale or the combinations of scales and levels, at which policies need to be developed and plans need to be implemented in order to manage a resource (Adger et al. 2005; Anderies et al. 2007; Berkes 2002; Berkes 2007a; Cash et al. 2006; Folke et al. 2007; Nagendra 2007; Ostrom et al. 2007; Perrings 2007; Plummer and Armitage 2007a). In the Kandozi case, rules of access to fishing grounds and to fish species vary among individuals, communities, location, the Kandozi group and the Yungani organizational level. Access institutions vary spatially, and depending upon if they are regulating access to fish in the Rimachi or in a smaller lake, access regime fluctuates between common access to exclusive access. However, the fishing management plan does not considers this spatiality of access institutions, and it regulates only four species and only in the Rimachi area. So in this case, control activities are operating at one scale, when there are multiple scales and levels. This mismatch of scale has been problematic for resource programs' success elsewhere (Cash et al. 2006).

Power sharing and self-interest. Following the legal fishing framework, enforcement of the management plan has been delegated to control committees, which are composed of people who have been elected in assemblies by other Kandozi. This process, which in turn is an external intervention (organized by WWF and governmental officials) placed power in the hands of the control committees' members, as happened elsewhere (Sarch 2001). While people from El Chino in Peru (Pinedo *et al.* 2002) maintain a control system based on local arrangements organized by the local people, the Kandozi followed the external model proposed by the law, WWF, and Yungani statutes.

It is true that the Kandozi participated in decisions about the control committees, but the modus operandi of the committees were standardized by fishing regulations. So, the Kandozi are not organized according to culturally informally accepted systems of control. Committee members were elected by other Kandozi, and now they are responsible for controlling, but they do not receive anything in exchange for this work. Control of lakes is not based on reciprocity relations or other social relationships common among the Kandozi. For these reasons, the legitimacy and functionality of Yungani is in doubt. This lack of legitimacy, which includes credibility, responsibility and authority of an organization (Plummer and Fitzgibbon 2004), could result in unwanted environmental and social outcomes, such as harvest of fish with eggs (Plummer and Armitage 2007a; Plummer and Fitzgibbon 2004; Robbins 1998) or social conflicts (Sekhar 2004).

Members of control committees, who were elected for long periods of time to control management of fish within the Kandozi territory, have been acting in self interest and have been making contracts with mestizos and also using gear not allowed within the territory, as reported during interviews by Kandozi people and WWF's staff. With all the

power to control, other Kandozi fishermen have not been able to change this situation. This has generated serious conflicts among the Kandozi, and social relations of trust and reciprocity have been undermined. These social relations are critical for complying with rules (Lu 2001). This self-interest behavior is one of the reasons of failure of governance of access to resources elsewhere (Folke et al. 2005). In the case of Kandozi at present (2009), nobody enforces the law, access is unequal and it is not regulated, and the level of conflict among the Kandozi is unsustainable, according to them.

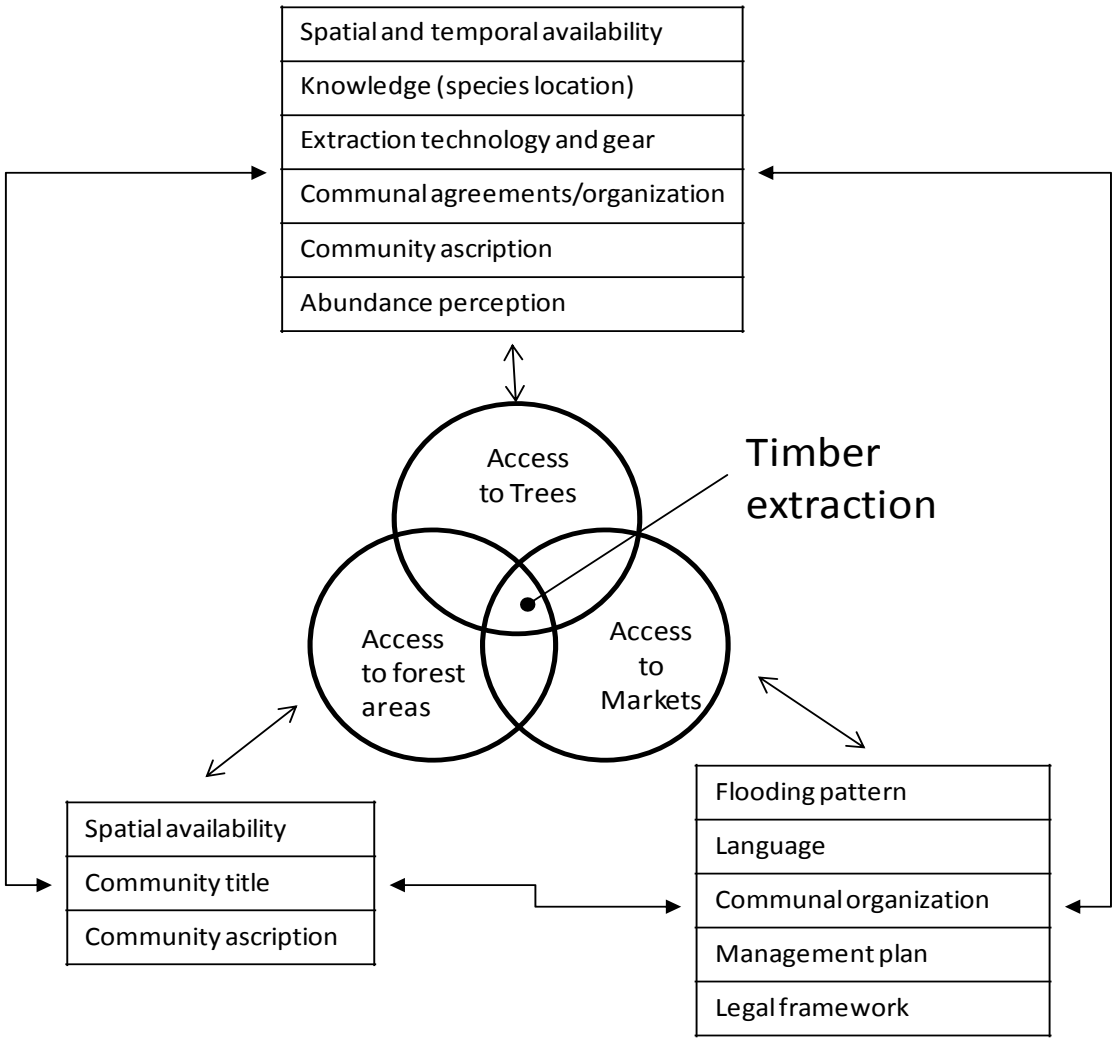
Reciprocity and Trust. In theory, control committees have the support of governmental officials, who go to the area during fishing season and share control responsibilities. However, due to the limited logistical capacity of the state, they cannot afford to travel to the Kandozi area, and control activities are exercised by the Kandozi almost exclusively. These committees have also been receiving financial support from WWF, which was providing them with motor boats and fuel for patrols. However, the Kandozi in charge of control are doing this activity without any mechanism of reciprocity with the rest of the Kandozi. So, while they have to exercise control activities, other Kandozi have access to fish. But in addition, some Kandozi have perceived that what control people receive from WWF is unfair, because only a few people are receiving these benefits. So, relations of reciprocity have been negatively affected. Furthermore, because the Kandozi controlling the activity are the ones that are giving access to mestizos through contracts, they are losing respect and trust from the rest of the Kandozi. Consequently, norms of reciprocity and trustworthiness have been eroded by external interventions and this has lead to conflicts among the Kandozi people. Access studies in India have shown the importance of good social relations for having control of access to fish (Sekhar 2007; Sekhar 2004).

Contemporary access to timber extraction

Similarly to fish, this discussion on access to timber is organized in three parts: access to trees, to the forest areas where these trees can be found, and access to the market through which the Kandozi can commercialize timber (Figure 5.22). The factors shaping access to timber are in general the same as for fishing, however as shown in Figure 5.22 they differ in how they operate.

Timber extraction in the Kandozi territory, as in other regions of the Peruvian Amazon (Bedoya Garland and Bedoya Silva-Santisteban 2005; Fagan and Shoobridge 2007), relies mostly on the extraction of tropical cedar trees. Trees are a non-mobile resource, and this characteristic facilitates access to them because location is more predictable and stable, individual trees can be found in the same general area and can be revisited. Nevertheless, this resource has to grow and be ready to be cut after some time, and then it has to be located within the community forest. But here again, trees are widely distributed in the forest, and not all the communities will have cedar trees or other commercial timber species (McSweeney 2005; Roth 2009).Consequently, the environment, as well as the nature of the resource, has an effect on access. This happens not only for the Kandozi area, but it can be generalized for other areas too (Adger *et al.* 2005; Begossi 2001). But there are several other rules that in combination with the physical availability of trees, determine who has access to trees for timber in the Kandozi area (Figure 5.22).

Figure 5.22: Access to timber extraction



If a tree is available, in theory a Kandozi has access to it if he can identify the tropical cedar trees (which may be one of perhaps 1000 other local tree species), if he knows how to cut it and is able to transport it. In practice notwithstanding, access to trees is ruled by the community assembly (all the household heads and leaders of the

community) where cedar trees are located. The community has to decide first, whether they will do timber extraction or not. If they will, then the communal leader has to negotiate with a logger in order to agree on volumes, prices, dates and transportation of logs. Agreements regarding timber extraction will have to be by consensus, so a Kandozi will depend on all the members of his community for gaining access to a tree. In addition, the community assembly also decides how many trees a Kandozi can cut. If the majority of the Kandozi in a community perceive that the amount of trees is declining, they halt the harvest and limit access to the entire community. So in this case, as in others (Lu 2001; Tucker *et al.* 2007), community organization is key for creating and enforcing rules regarding access to trees. This behavior at the communal level is relatively new (since the creation of communities around the sixties). Nonetheless, the respect for leaders and the idea that everybody (within the community in this case) is entitled to have access to trees are inherent to the Kandozi, who leads to communal decisions about timber regulations.

In order to analyze access to timber extraction areas, the unit of analysis needs to be the community, which includes all the people who live there. These conclusions are supported by the interviews done with the Kandozi during 2009. First of all, an extraction area is located within the community boundaries or within the communal title limits. The rules are that any Kandozi ascribed to a community has access to timber within it. Extraction areas vary in size and species composition. This is because of the spatial heterogeneity of the Kandozi territory. This heterogeneity is also the reason why some communities contain an extraction area and others do not. Consequently, access is spatially different among communities because of these characteristics.

In theory, a community needs a forestry management plan and an annual operational plan to commercialize timber, according to the forestry law. However this is

not currently enforced by the forestry governmental authority. In order to gain access to the market, the Kandozi make an agreement with the logger in order to sell the timber. Thus, they need to negotiate with the logger, and the more they know about logging, prices, legal frameworks and other requirements by the law, they are in a better position to negotiate with the logger and have access to better conditions from the timber commercialization. Spanish is also important for the Kandozi for negotiating with the logger. Some decisions are made at the community level, as for example the volume of timber that will be sold, or the logger who they will commercialize with. Transportation of the logs, either by the logger or by the Kandozi, needs to be done during flood season. Therefore, the environment is also influencing when the Kandozi have access to place logs on the market. This effect that the environment has over other indigenous economies has been studied also in Loreto (Pyhälä *et al.* 2006).

Access to the market is also influenced by the Kandozi's perception on abundance of tree and benefits as demonstrated by other studies (Sarkar 2008). At present (2009) all the Kandozi communities have halted timber extraction not only because they realized that trees are farther from their houses, but also because they perceive that the benefits, in this case for cash income, are not sufficient enough to justify the extraction of all their trees. This demonstrates that all the factors found to shape access to timber are intermingled and operate together interchangeably and at different spatial and temporal scales and levels.

Challenges and conflicts of governing access to timber extraction

Access to timber extraction also faces challenges. These challenges have generated conflicts among communities, for gaining and maintaining access to timber.

Mismatch. The forestry law through the forestry management plan and forestry

permits, allows the Kandozi to have access to timber within community boundaries. However, for the success of forestry management is better to have larger forest areas in order to facilitate its recovery in the long term (Salo and Toivonen 2009). Furthermore, the Kandozi are dividing their territory in entities called communities not only for land tenure purposes, but with the objective of gaining access to extraction areas. But this is resulting in un-equal access to natural resources and hence, has caused divisions among some communities, especially during the titling process. Consequently, the forestry law regulates forestry management at the communal scale, while communal boundaries do not match with any ecological scale at which forestry management should be done.

Centralized control. Governmental authorities are supposed to control timber extraction activities, according to the national forestry law. However, the remoteness of the area and the limited logistical capacity of the local, regional and national governments impede any effective control of logging activities. This creates an illegal logging activity, in which loggers are the ones who are benefiting the most with timber extraction as in other regions of the Amazon (Bedoya Garland and Bedoya Silva-Santisteban 2005; Salo and Toivonen 2009). Although the Kandozi have access to the resource, they do not have access to the benefits because they are often deceived by the loggers. The forestry law then is in theory centralizing all the control operations without transferring any power and responsibility for governing forestry resources to the Kandozi people as happens in many other places (Larson and Soto 2008; Ribot *et al.* 2006). But what is happening in practice is that the lack of enforcement of this law is causing a reaction of the Kandozi to protect by themselves their timber and is resulting in self-organization processes.

A comparison between access to fish and timber

Differences

Level of decision making. Fishing and timber extraction are activities done at the household level of the Kandozi. The benefits obtained from the use of natural resources are also household-level, although they may work together in some occasions. Households have close fishing campgrounds among them, or they may have trees close to another person's trees. However, decisions regarding access to fish and timber are made at different levels. A Kandozi man decides where, what, when and how to fish by himself. Sometimes this decision is influenced by his wife's opinions. And although there are some rules regarding zoning, species, fishing seasons and gear, there are still common areas where the Kandozi can fish without any restriction. There are no rules for how much a person can fish.

On the contrary, with timber the situation is quite different. All the decisions regarding volumes, extraction areas, prices, and gear are made by the community assembly. So the Kandozi who wants to sell logs, needs the entire community to agree with the activity and with the amounts of trees he wants to extract.

This different level of decision making is in relation to where conflicts occur. Social relations among Kandozi fishers have eroded as a consequence of access conflicts, whereas Kandozi who do logging need to be united in order to arrive to consensus for this activity. Nonetheless, conflicts related to gaining access to timber exist between communities, because some of them want to have greater areas for timber and want to expand their titled area.

Size of the users group. All the Kandozi people fish in their territory as individuals and households, and they have access to fish anywhere in the Rimachi lake.

However, they have restricted areas if they live in a particular community or if they have relatives in other communities. In addition, the legal framework through the management plan regulates members of Yungani who are from different communities and different kin groups. So, rules for fishing need to consider the entire Kandozi group. Rules of access need to take these different levels into account. Rules of access to timber on the contrary, regulate among communities, who are discrete entities, and regulate the people within each community. Not all the communities have forest, therefore not all the Kandozi do timber extraction. Thus, the size of the group that needs to be regulated for cutting logs is reduced.

Kinship, and Land titling and tenure. Kinship facilitates access to fish for the Kandozi, especially to fishing grounds. This is not the case for timber. People have access to trees only if they live in the community that has timber. The opposite is with titled communities. The title facilitates access to timber to the people who lives within that community. But the title does not restricts or favor access to fish, at least not with the same degree as for timber. However, it is uncertain how land titling will have an effect on access to fish in the future.

Decentralization. The current fishing law of 1992 allows for the devolution of power to the communities. Fishing activities can be controlled by local people with the support from government authorities. For timber control arrangements are different. No local control has been transferred to locals and the forestry activity still centralizes control operations. Some studies have concluded that decentralization is an important element for the success of natural resource management (Ribot et al. 2006; Tacconi 2007). However, in my opinion, this cannot be concluded in this study, since at present, fishing activities are missing local and governmental control, while logging has been

halted by the Kandozi people, without governmental intervention, and probably because of their absence.

Collective action. Studies on collective action show that factors needed to generate collective action processes vary and depend on each case (Poteete and Ostrom 2004). However there are some elements that can promote collective action depending upon the case. Strong leadership, size and heterogeneity of the group involved and threats to resources have been analyzed as factors that contribute to self-organization and collective action (Bremner and Lu 2006; Seixas Simao and Davy 2007).

In the Kandozi case, timber and fish differ among each other in some of these factors. Fishermen for example, are a larger group of people, from different communities and with different level of market-based activities, while logging is ruled by a smaller group of people (community-level) with more similar economies and interest and who are usually kin related. There has been a lack of collective action of fish, and control of access to fish was disorganized in 2009. People within some Kandozi communities on the contrary, collectively decided to halt timber extraction. But to better understand these differences, it is important to analyze collective action processes and the factors influencing this process over the history of natural resource management in the Kandozi territory.

Similarities

In both cases, knowledge, technology, language and other factors related to knowledge, appeared to shape access to resources, fish and timber and its associated benefits. In addition, legal requirements for performing both activities according to the law are high and difficult to meet without external financial and technical support. Furthermore, relationships with mestizos are a need in both cases in order to have access

to the market, to cash income and to technology. An additional similarity is the spatiality of access. In both cases, access institutions will respond to how resources are dispersed upon the entire territory, and how people use them on a daily basis.

As a conclusion, access should be studied considering its spatiality. Access studies additionally should recognize that access to natural resources is a complex process that has multiple factors interacting among them at different moments, and that those factors will have an effect on how people use resources and how they benefit from them. In addition, access studies should give more importance to environmental variables, since it cannot be assumed that the natural resources are always available. Availability is the first condition that needs to be met in order to have access to resources. Finally, access institutions to natural resources change over time; hence an historical approach is needed to better understand access and the factors shaping it. The historical view of access to natural resources by the Kandozi people is presented in Chapter seven.

CHAPTER SIX

Well-being of the Kandozi people

6.1. INTRODUCTION

For neoliberal open market economies as in Peru, land is only one of several production factors. For indigenous people on the contrary, land is part of their identity and their social, economic and emotional lives (Castree 2004; García Hierro and Surralles 2004; Hvalkof 2006; Vallejo 2009). Furthermore, nature is essential for indigenous well-being, both physical and spiritual. For the Kandozi people this relationship reflects their reliance on nature. Or at least this was true before the complete capitalization of the production relationships, as happened in other places (McAfee 1999; Schmink and Wood 1987).

The distinct ways of thinking about nature, including various values and meanings that exist among societies (Escobar 1996; Hvalkof 2006; McAfee 1999) contribute to clashes. State interventions for developing Amazonian indigenous communities have been sometimes contested with indigenous' own views of development (Anaya 2009; Bremner and Lu 2006; Perreault 2006; Ryan 2008). While in market economies people compete for resources, in traditional economies for example, nobody should starve if others have food. Indigenous people have traditionally extracted resources based on subsistence needs (García Hierro and Surralles 2004; García 2007a; Pinedo *et al.* 2002; Smith 2002).

Market-oriented mechanisms for selecting environmental goods and services can be destructive for the subsistence of indigenous groups. The problem has been and still is the existence of externalities. The market will select only one or a few of the environmental services available without considering the impact on the rest of the

services (Godoy et al. 2005). Furthermore, the market selects resources according to possibilities of profit making at that moment and not based on historic relations between local population and environment (Nietschmann 1973). Decrease of the paiche fish population in Lake Rimachi for example, is an example of market's negative effect on resources.

For the Kandozi, as for other indigenous people, well-being and quality of life are linked to securing livelihoods and meeting subsistence needs for today and for future generations (Allison and Ellis 2001; Huanacuni Mamani 2010; Ichikawa et al. 2010) through the use of natural resources and ecosystem services. Studies in forestry show that the forest dwelling population's well-being depends upon their ability to access resources for livelihoods (Pyhälä et al. 2006). These relations between well-being and resources or ecosystems, have also been highlighted in other studies. The environmental justice literature for example, conceives of the ecosystem as the basis for life and well-being (Lee 2002). Research on biodiversity conservation argues that ecosystem management and human well-being should be integrated (Berkes 2007b; Kittinger et al. 2010). And research on natural resource management claims that resource management initiatives not only contribute to the sustainability of resource use, but also to improvements of social well-being (Plummer and Armitage 2007a; Plummer and Armitage 2007b).

The sense of well-being has also been discussed in relation to govern access to natural resources and environmental services (Leach et al. 1999). Access to basic materials, which include food and environmental services, has been considered one of the five dimensions of well-being by the Millennium Ecosystem Assessment (Millennium Ecosystem Assessment 2003). In the case of the Kandozi, access to natural resources will lead to attain well-being but only if a set of social and environmental conditions are first

met. In order to better understand how the Kandozi manage to meet their needs and achieve well-being, this chapter presents an analysis of what the Kandozi perceive as quality of life and well-being. It also analyzes income and expense data which gives insights about the Kandozi economy and needs.

6.2. THE KANDOZI'S QUALITY OF LIFE

Vivir tranquilo or táamaama

Like other indigenous groups in the Amazon (Pyhälä et al. 2006), the environment still provides the Kandozi with the means for their livelihood and their social reproduction (Surralles 2007, 2009). The diverse ecosystems and the richness of natural resources in this area are subjected to be seasonally exploited for food, housing, health, recreation and others. Because the Kandozi territory still provides all kind of resources to the people, they can manage their time, keep traditions and therefore maintain their cultural identity. These are important components of the Kandozi well-being according to their own view, manifested during interviews in 2009 and as documented in the anthropological literature (Surralles 2007).

According to census data from 2007, 79% of the population of the Datem del Marañon Province from Loreto is poor (Instituto Nacional de Estadística e Informática 2007a). This province is where the Kandozi territory is located. The Peruvian government through the Statistics and Information National Institute (INEI) considers three types of poverty: contextual, structural, and chronic. In the contextual sense, people have their expenditures under the level of the poverty line, but basic needs are satisfied. Structural poverty has an adequate expenditure level and basic needs are not met. Chronic poverty is the combination of the two (Instituto Nacional de Estadística e Informática 2007b).

Basic needs are considered by the INEI to be education, housing, and health, among others. So, the Kandozi people are considered poor people by the Peruvian government. However, they do not consider themselves poor. As one Kandozi claimed in 2009:

> "…nosotros no somos pobres, mira este lago que tenemos, con tanto pescado. Si tenemos hambre, sólo nos levantamos de la hamaca, tiramos la red y sacamos lo que necesitamos para comer…" (we are not poor, look at the lake we have, so many fish in there. If we are hungry, we just need to stand up from the hammock, put in a net and we will get what we need to eat).

Nevertheless, the Kandozi people during interviews in 2009 recognized that at present they have acquired other needs that cannot be met by subsistence activities. Therefore they said that they took the opportunity to enter the market as a subsidiary way of obtaining monetary income to fulfill other needs, such as expenses of health care. But despite more recent needs, the Kandozi argued in 2009 that they extract resources based on the needs they have at a particular moment and based on what is available in nature. They do not extract resources thinking about future needs or in terms of increasing assets. In most cases during interviews fishermen answered the question of how much they fish, saying that the amount of fish they catch is based on needs: "yo pesco en base a necesidad" (I fish based on need). Not only fish is caught based on needs, other resources such as meat and palm hearts are too. However, it is important to mention that they do think strategically in future access to natural resources when they decide who to marry with (see Chapter five).

During informal conversations and when the Kandozi people were asked in 2009 about how they wanted to live, they answered "quiero vivir tranquilo" (I want to live calmly, or I want to live without worries). "Vivir tranquilo" implies several things for a Kandozi. According to them, it means having access to and control of their resources

such as fish, meat, leaves, suri (beetle larvae *Rhynchoporus palmarum*), palm heart, timber and areas of resource extraction. All these resources and others are meant to satisfy their food needs and whatever women feel like eating, and to be sufficient to build their houses and boats. "Vivir tranquilo" also means not having conflicts with other Kandozi, especially with relatives. It means not having strangers or mestizo people within the territory. Some people claimed also that they want to be able to make their own decisions and to be able to transit their territory freely, without encountering strange people or people they do not trust.

According to anthropologist Alexandre Surrallés (pers.comm.2010), "vivir tranquilo" could be translated to the Kandozi word táamaama. He argues that the root táa- of this word is the base of several other words that refer to the daily life, where farming, fishing, and other daily activities take place normally, without worries, with *masato* and food and with social relationships in balance. So the word táamaama may be the Kandozi word that best describes what vivir tranquilo means for a Kandozi.

Nonetheless, today the Kandozi have a bigger challenge in order to be able to live without worries. Needs such as health and education are relatively new for them and consequently they do not necessarily have the means to fulfill them. For example, the Kandozi mentioned in 2009 that they want their children and women to be healthy and to avoid dying because of the lack of medical care. They want the state to provide adequate health care not only in faraway hospitals but also in places near the communities. Health-related emergencies need to be taken care of in a timely manner. Sometimes they go to the "brujo" or shaman, but this person also charges high prices. So, the Kandozi wants to earn money to be able to go to the shaman or doctor for a cure. This money needs come from the commercialization of fish, timber, game or other resources. They cannot live

without worries if they do not have the means to treat emergencies related to health.

The Kandozi want to improve their quality of life through education. They said during interviews that if their children and young people are well educated then they will not be deceived by mestizos and they will have more opportunities than the older people had. The Kandozi people think that if young people are better educated, then they will be able to live calmly, without worries of losing traditions, identity and with the possibility of adapting to their changing environment. The next section describes with more details two of the emergent needs they have, health and education.

Health needs

For the Kandozi people, health care has become critical for their continuity as an indigenous group. Before hepatitis B turned out to be an epidemic (UNICEF 2005) the Kandozi were relying on shamans and medicinal plants to treat their health problems and diseases. They were not successful all the times in curing themselves, but they did not feel they needed help from outsiders, like they do today. Health was one of the biggest problems the Kandozi mentioned they have in 2009, especially because they do not know how to deal with it. They said that they are coping with diseases today that they do not know how to treat. Too many people are dying from hepatitis B and from other unknown reasons and they feel powerless.

Whenever a person has a health care need that cannot be treated in the place where this person lives, this person needs to be taken either to Musa Karusha, Ullpayacu, San Lorenzo or if it is very severe, he/she has to be taken to the city of Yurimaguas. This implies great amounts of money, not only for medicines and health care attention, but also for paying for transportation, lodging and food outside the community. When people were asked if they save money for health emergencies they say no. They look for the

money they need at the moment they have the emergency, not before.

Struggles with health-related emergencies in relation to money, are not only that they may need more money than usual, but they need it right away. This is the time when it is very difficult for a Kandozi to acquire the amount of money they need at a particular moment to fulfill a health need. What happens then is that they will look for any means to earn some money. If the health problem is during fishing season, they will fish the amount they estimate they need to take care of the problem. If there is no fish, or if they are in a community in the upper basin, they will hunt mammals or turtles. They can also ask for loans from relatives, other Kandozi or from mestizos.

Hepatitis has been devastating for the Kandozi, not only because of the amount of death and of sick people, but also because the state of depression and fear that it caused among Kandozi people. This situation has prevented the Kandozi from living calmly in the last decades. They have an increasing need for better health care services. These services cannot come from the environment, therefore they need to sell more resources to be able to have enough money to pay for health care for hepatitis B and other health problems.

This situation of health emergencies will lead in addition to contracts with loggers or with fishermen from Ullpayacu. These mestizo people (who are the *patrones*) will give the money in advance that the Kandozi needs to fulfill his health need. Fishermen or the logger (*patrones*) will ask for their pay back. This pay back can be in cash if the Kandozi have the money, or it can be paid by fishing or cutting trees. Usually, the *patrones* will prefer to get their money back through fishing or logging because they can have greater gains. They do not comply with local agreements about where and what to fish or where and how many trees to cut. Because of these loans with mestizos, the Kandozi will have

relationships with them until they can pay back the loan directly (with cash) or indirectly (until mestizos have enough fish or timber products).

Some communities have been investing money in building a health post, or at least in having a communal first aid kit, with additional medicines bought by community members. In some communities, a Kandozi was elected to be in charge of the first aid kit and to administer the medicines. However, only in Nuevo Egipto the elected person did a good job managing communal goods. In the rest of the communities the first aid kit was used up and never got replaced.

Education needs

As in the case of health, education is a growing need that cannot be fulfilled directly from the environment. During interviews and informal conversations in 2009 with men and women, they mentioned that they want their children to go to school, and not only boys but also girls. They feel they need to learn Spanish and other things (that mestizos learn) in order to be able to stay in their communities and not be cheated by the mestizos (especially while they are in dependent relationships, see Box 7). What they really want is a school in each community that provides bilingual (Spanish and Kandozi) and intercultural education in order for them to maintain their language, traditions and values. This is also part of the life plan they have developed as an indigenous group. However, this is not an easy task. It depends on how well they are organized at the community and higher level and also on regional and national governmental budgets.

As mentioned earlier, the government provides communities with primary schools and pays for one teacher in each school. However, communities have to have at least 40 students in order to be able to receive educational services from the government. Therefore, there are some communities that cannot meet this requirement and have to

find a way to either increase the size of their population or find a nearby community that has a school for their children. There are communities though, such as Huambracocha that cannot have access to education in their place yet. Children from this community are not attending school, because they are too far from the nearest community with a school.

In 2009 one new secondary school (high school) was operating in Musa Karusha and a new one was being built in Nueva Yarina. Before these two schools, students had to go to Ullpayacu or San Lorenzo to receive secondary education. Some people mentioned however that they still want to send their children to Ullpayacu because they will be able to learn better Spanish there as they will have to interact more with mestizos.

Schooling expenses within the communities are basically for notebooks and pencils, because the Ministry of Education provides books and other materials. However, if the children are attending school in Ullpayacu or other places outside communities, this implies other expenses. They will have to pay for living expenses, school uniforms, books, pencils and other school materials. This can be very expensive for a Kandozi. So, parents or sometimes school-age Kandozi fish, hunt, or cut timber to pay for their education costs.

During January 2009 for example, a 17 year old Kandozi was fishing in Lake Rimachi and was based at Musa Karusha. He was from the Pirumba community but asked for permission from the apu from Musa to stay there while he fished in Lake Rimachi. He had to fish as much as he could, because he was acquiring all the money for his living expenses in Ullpayacu and other educational expenses. He was attending secondary school but had no father. So, he was financially supporting his family, who live with him in Ullpayacu, and paying for schooling with the money earned from fishing.

It is worth mentioning that the first fishing contracts for educational purposes between a Kandozi and mestizos started before 1995. A Kandozi was interviewed in May 2009 for this research about his education. He is the only Kandozi who could study nursing. This Kandozi (who will be called here Alberto) explained how he was studying nursing in Iquitos with the support from a fellowship. But his fellowship which covered living expenses among other things, came to an end in 1995. At that time there were other Kandozi men in Iquitos studying education. Alberto expressed his need for money to the other Kandozi and they asked him why he did not have a fishing contract. All of the other Kandozi studying in Iquitos had done the same, but Alberto did not know about this funding mechanism. So, Alberto asked the Kandozi federation FECONACADIP for help, so the federation´s president negotiated a contract for Alberto with a mestizo. Alberto said during the interview that a week after he asked for this support he received a thousand soles from a fishing contract, which was enough for him. So, fishing resources paid for Alberto´s education and other Kandozi as well.

The fishing contract did not put Alberto in debt because that system differs from the *habilitación* (see Box 6). But during the nineties contracts were not a common mechanism, and most of the people worked under a system of indebtedness.

Box. 7: The system of *habilitación y enganche*: relations of debts

A "system of indebtedness" (Gow 1991), which is a form of commercial relationship in the Peruvian Amazon and elsewhere (Bedoya Garland and Bedoya Silva-Santisteban 2005) is known as *habilitación.* It consists of the provision of money and/or goods from one person (usually a mestizo) to another (a Kandozi in this case) to allow the receiver (*habilitado*) to engage in fishing, timber extraction or another productive activity (Gow

1991). The provider is called the *patron.*

This system of *habilitación,* is in fact a chain of such relationships. In the case of the Kandozi for example, a patron who buys fish or timber in the Kandozi territory may have his *patrón* in Yurimagas and the latter can have a *patrón* or *habilitador* in Tarapoto or Iquitos. A *patrón* in Yurimaguas for example can have several *habilitados,* who at the same time are *patrones* in a more localized area.

All the Kandozi involved in timber extraction use the *habilitación* system. When the Kandozi need cash for example, and it is not fishing season, or if they need cash immediately, they can ask a logger, who is the *patrón,* to give them cash in advance. Later, the patron will go to the community and will tell the people how many trees they need to give him to pay back the credit. Another way of working with habilitation systems, is when the logger give the Kandozi sawmills, machetes, chainsaws, tractors or other materials to cut and transport logs. Once the patron has cut the logs, he will tell the Kandozi the volume of timber that has been cut.

Furthermore, the logger charges the Kandozi for the materials, fuel, and all the costs implied in the activity, and usually at the end of the activity the Kandozi end up being in dept to the patron. Commonly, the logger pays 25% of the total production to the Kandozi and he keeps the 75%. He argues that the 75% includes the costs of the extraction. So at the end of the transaction, the Kandozi will receive only 25% of the production.

For fishing activities, the Kandozi also used to have *patrones*. The *patrones* usually gave the Kandozi nets or other fishing gear. However at present with the fishing contracts the situation has changed. The Kandozi are now the ones that have more power to decide the conditions of the contract. They decide the amount of money they want, or the amount of fish the mestizo will catch. Sometimes, mestizos that are in a fishing contract with a Kandozi operate as *patrones,* because they give the Kandozi cash in advance. However, they will agree first on the conditions of that credit.

Needs beyond Money

The Kandozi people not only mentioned education and health as needs, they also claimed they want other things that are not provided by the government or that only can be bought. They mentioned how important is to have good relationships with their brothers and sisters, relatives or with other Kandozi people. Part of "vivir tranquilo" is living without conflicts among them, or at least with mechanisms to resolve disputes. Men in particular, want to be able to find a woman to marry with and have a family without worries.

According to anthropological studies (Surralles 2009), one of the main reasons why the Kandozi men had wars or violent encounters among themselves was because of women and their "predatory ideology" (includes the notion of capturing people). In the past, they had to look for women in the different settlements where the Kandozi were located. Once a Kandozi man found a woman he liked, he took her with him without permission from her family (kidnapped her), causing conflicts between both families (Surralles 2009). However, according to two Kandozi who were interviewed in 2009, these wars caused by women were in the past. For the last decades (they did not know exactly since when) the Kandozi have been exchanging women between families, as explained in Chapter Three, as a mechanism for reducing conflicts and building alliances between families. At present, these exchanges are less frequent and women have started to choose who to marry with. This situation worries some men, because it is harder now to find a partner.

Daily life can also be conflictive, especially for a society with individualistic characteristics. This makes reciprocity and exchange difficult, which are also part of the "predatory ideology" (Surralles 2009). So, if a Kandozi exchanges something (or

somebody) they do it to avoid a greater loss. This loss can be a life. Therefore, they try to avoid conflicts, because ultimate solutions can result in killing people from the families that were involved in the conflict.

One way of avoiding conflicts between families within a community for example is by moving away to another community. Conflicts are very common in communities, especially in communities with large population (more than 100 people). People argue that they struggle for space, because of the dogs that bother the chickens, for the kids that fight against each other when they play, or for other reasons. But in order to calm these situations they usually migrate to live in other communities or they establish new communities. Or for example, if somebody does not comply with communal rules, the apu will talk to that person in order to avoid further discussion with other members of the community. So, they have different mechanisms to resolve disputes.

Kandozi leaders have also played a key role in solving conflicts among the Kandozi. And as they said in 2009, they do not like to live in conflict. They always try to find a solution (violent or not) in order to be able to live without worries (vivir tranquilo).

Earnings and expense distribution patterns

Income distribution

In January 2009 the Kandozi fishermen established fishing camps in the Rimachi, Chuinda, Chapuli and Pirumba areas to catch commercial fish species and to sell them to mestizos. This is usually the time of the year when the Kandozi's income comes almost exclusively from fishing. Their entire catch is for commercialization, unless they capture small fish that do not have commercial value.

According to the fishermen who were interviewed in 2009, this fishing season

lasted less than usual. Water started to rise earlier in January. Fish spawning migration events which commonly happen in February occurred early in January. So, some people who were camping near the Rimachi area and in other fishing grounds took advantage of catching gravid fish (fish with eggs). Fish spawn when the water rises, but fishing camps are not suitable anymore when the water level is high. However, people managed to stay longer and catch gravid fish. They sold the eggs in addition (separately) to the fish and had an increased income. However, the Kandozi agreed not to catch gravid fish because this affects fish stocks sustainability.

After the 2009 fishing season was finished, I asked 77 fishermen in different communities about their fishing practices, income and how they spend the money they received during this fishing season. These interviews were done as a complement of the previous qualitative description of well-being, because one of the benefits from governing access to natural resources is having access to cash income. And although these results are limited and cannot be simply extrapolated to the rest of the year and cannot be used to conclude about Kandozi's investments, they are useful to explore if there are any differences of the expenditure patterns among the fishermen who were interviewed.

Fishermen were opportunistically sampled and it was more a matter of who wanted to take the time and who was willing to answer personal questions about their income and detailed expenses. It was interesting to see that some fishermen who were asked about their fishing activity in the January season said that they did not go fishing because they (3 people) were doing *chacras* (small agricultural fields), or taking care of their pregnant wife (1 person), or working for the Regional Indigenous Federation (CORPI) (1 person). So, they declined receiving a relatively important monetary income

the year 2009 for those reasons.

Earnings. Earnings varied from S/. 40.0 to S/. 2800.0 with a mean of S/. 690.4 and a standard deviation of 493.49. (The exchange rate was S/.2.85 per U$1.0 in February 2009). The price of fish during this season was S/. 4.0 per kilo. Earnings correspond to the money received from selling fish only, not to the fish eggs that were also sold. (This information about fish eggs is not trustworthy because it is illegal to fish during spawning season, so it could be that not all fishermen told the truth). These earnings then, do not include other sources of income that they receive along the year, such as game, fruits, fish (from the October fishing season) and timber. Nevertheless, it is worth mentioning that according to the Kandozi and people from WWF (who have spent 6 years already analyzing fishing activities with the Kandozi) the January-February fishing season is the most important one, in terms of fishing volumes and cash income generation (FECONAKADIP and Yungani 2007).

Length of fishing period. The number of days of fishing differed among the Kandozi. It varied from 2 to 30 days (Table 6.1) with a mean of 13.34 days. Almost 24% of the people spent 10 days fishing. Earnings could be analyzed in relation to the number of days fishing. Nonetheless, because the Kandozi used different areas, with a variety of fishing gear type and number (number of nets), and because they have different reasons for why and when to stop fishing, the analysis needs additional data. Reasons for stopping fishing included but are not limited to the water level, and needs that were satisfied.

Table 6.1: Descriptive Statistics and frequencies for number of fishing days

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Number of fishing days	67	2	30	13.34	7.76

Number of fishing days	2	4	5	7	8	9	10	12	14	15	19	20	30	Total
Frequen-cy	1	2	4	8	5	1	16	1	7	8	1	4	9	67
Percent	1.5	3.0	6.0	11.9	7.5	1.5	23.9	1.5	10.4	11.9	1.5	6.0	13.4	100

Group Ages. Kandozi people start commercially fishing as adolescents. A Kandozi of 13 years old (Table 6.2), another of 14 and three of 15 years old were interviewed after the fishing season in January 2009. They fished by their own and did the commercialization of their products independently from their families. And as will be explained further below, they spent their money buying products for themselves only, despite the fact that they still live with their parents.

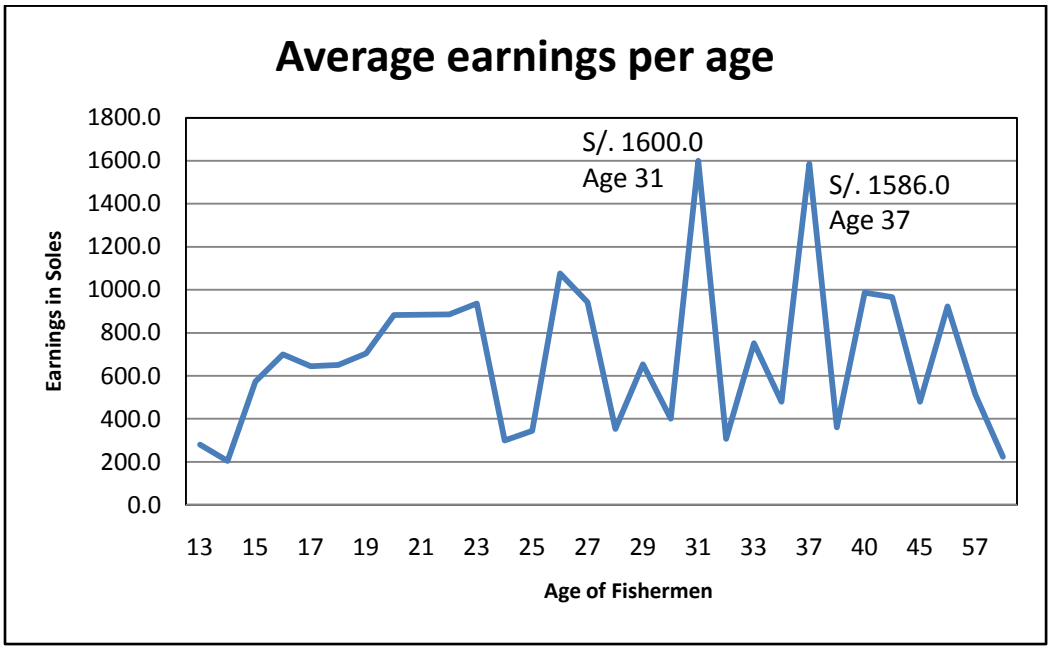
Ages ranged between 13 and 65 years old. Average earnings have been analyzed in relation to age, however, these results are also referential, due to other variables that influence fish production (technology, length of the fishing period, needs, among others). Figure 6.1 show average earnings per age and provides a visual tool to see how income differs among ages in the January 2009 fishing season. The group of 31 years old was the one that in average earned the most.

The Kandozi fisher who earned the most in this season (S/.2800) was a person of 37 years old, and the one that earned the least was 58 years old with only S/. 40.0. How these people spent these different amounts of income will be analyzed in the next section.

Table 6.2: Descriptive Statistics for Age

Descriptive Statistics	N	Minimum	Maximum	Mean	Std. Deviation
Age	71	13	65	28.04	11.218

Figure 6.1: Average earnings per age



Expenditure patterns

When the Kandozi were asked about where they spent the money earned during the January 2009 fishing season, they claimed that they spent it either in Musa Karusha where mestizo traders go to sell merchandise, or in Ullpayacu and San Lorenzo towns where commerce (small stores, markets) can be found. In these places, the Kandozi will find things that they want or need to buy. If they buy the merchandise in Musa Karusha, they will have to pay higher prices, because the mestizos charge the Kandozi as much as they please. In Ullpayacu and especially in San Lorenzo, prices are better, however the Kandozi have to spend money on fuel, and sometimes hotel in those places.

Eleven Kandozi (out of the 67) mentioned they have saved some of their money from the fishing season, but the others spent it all. This data was validated with additional

questions, such as questions about how would they spent their savings, why they did spent it all, etc. So, I trust this data. During informal interviews in 2009 the Kandozi explained that whenever they need money for health care, education, to buy fuel, or something they need at a particular moment, they will hunt, fish, or gather some fruits (depending upon seasonality). They will take those products to the markets and sell them for money. So, they do not need to keep money for future needs. There are few communities that are looking for production activities in order to have other cash income alternatives in their communities that are not so dependent on seasonality (see box 8).

Box. 8: Fish farm in Egipto community.

In January 2009, I visited the Egipto Kandozi community. It is located in the upper basin of the Chapuli river. I spent three days there and had the opportunity to talk to many households. They were a very well organized community. They had communal goods, such as a power generator, first aid medicines, and latrines for visitors. All these are absent in the rest of the Kandozi communities. They invited me and WWF´s staff to their community because they wanted to show us the area they have in their place to build a fish farm ("piscigranja"). They wanted to receive technical assistance (only) from WWF to construct the fish farm.

They explained to me that they wanted to live without worries ("vivir tranquilo") along the course of the year. They did not want to depend upon the fishing season to be able to fish and get cash income. They told me: "it is hard to depend on seasonal income when you have health emergencies". Especially for Egipto, which it is located far from Lake Rimachi (a day or two of travel in a peque peque), it was not easy to earn money from fish. They have game close to their community, but if they have an emergency, they did not want to depend upon hunting either for fast cash. So, they were planning as a community to build a fish farm and to raise fish there.

The Kandozi from Egipto have been thinking on the fish farm as a type of bank for them. If they need cash, they can take the fish from the *piscigranja* and take it to San Lorenzo or Ullpayacu to sell it. But this would be done in case of emergencies. They were also thinking of having the fish farm in their communities in order to have closer availability of fish to eat. If they could raise carachamas, and other local species for their daily consumption, then they could stay at the community instead of going to other places to get fish or other protein during non-fishing season. They argue that they could work more in the *chacras* and have more crops to eat, together with fish from the *piscigranja*. They also mentioned that if they could have a fish source within their community limits, they could avoid conflicts with other Kandozi over small lakes or fish.

One by one the Kandozi were asked about how they spent their income from fishing, in particular from the January 2009 fishing season. They were reticent to answer but they did when no other Kandozi were listening to them. People that answered the questions remembered with great detail how the spent the money, because most of it was spent in one or two days. It is important to emphasize that these data do not correspond to how they spent their money along the year, since this could vary from season to season. Besides, with the size of this sample and because it only responds to one moment, it does not include all the possibilities of expenditures. However it gives an idea and a tendency of how are people using their earnings.

Expenditure categories. In order to facilitate the analysis of expenditures, the different items bought by the Kandozi have been grouped in 14 expenditure categories (Table 6.3) using similar studies as a reference (Blundell et al. 1994; Wang et al. 2006). In addition, these categories have also been grouped in four broader categories following McSweeney's (2004) work. However, some of the items can be included in one or more of these broader categories.

Table 6.3: Expenditure Categories

Expenditure Categories		Expenditure Items
Consumption/household reproduction	Cloth and Accessories	Clothing, fabric, shoes, backpacks, belts, watches, other accessories
	Household Utensils	Flash lights, batteries, silverware, buckets, aluminum cooking pots, machete, ax, mosquito nets
	Daily goods	Personal care items (soap, perfume, etc.)
	Food	Rice, sugar, bread, milk
Production	Fishing and hunting supplies	Nets, floating devices, hooks, thread, salt, plastics, shotgun and cartridges,
	Transportation	Boats, engines, fuel, oil for boats
Luxury goods	Durable goods	CD Player, Radio, TV, Video player, etc.
	Alcohol / Sodas/ Candies	Beer, sodas, candies, instant refreshments
Other	Education	Tuition, books and uniform
	Health	Medicine, dentist, doctor's payment
	Services	Meals and lodging in San Lorenzo or Ullpayacu
	Credits / Loans	Credit payments and loans given
	Savings	Savings without specification

Categories such as household utensils (machete, ax), fishing and hunting supplies (shotgun and cartridges), and transportation can be grouped in other broader categories. Machetes and axes are used for working in the *chacras* and to harvest daily products for food as plantains and manioc. However, they are also used when people fish or hunt. Shotguns are a supply for hunting, however sometimes hunting products are a source of income (production) and sometimes are a source of food.

These categories have varied over time. When people were asked about their expenses, they mentioned for example, that in the past they did not have to buy aluminum

cooking pots, because women made clay pots; but at present women complain that it is too much work. Other expenses such as radios, DVD players, beer (luxury goods), sugar, fishing nets, education cost and others were not necessary in past decades, according to interviews.

General expenses. Almost 25% of the total money spent by 67 Kandozi was on clothing and accessories (Table 6.4). Most of the people (84.6%) interviewed in 2009 bought some clothing or accessory. Furthermore, 25% of the items considered clothing and accessories were cloth, which means that women are sewing clothing for themselves and their daughters. Regarding fishing material, almost half (48.9%) of fishing and hunting supplies are invested in buying fishing gear (nets, floating devices, and harpoon) and the rest of the products were shotguns, salt, among others. This amount is important because about 10% of the total expenses are spent in increasing fishing efforts by the Kandozi, which at the end will have an unknown effect on fishing stocks. In this case, 80% of the people invested in fishing and hunting supplies. So, not only mestizos are now able to fish intensively in Lake Rimachi, but also Kandozi fishermen will be incorporating additional pressure onto the Lake Rimachi system.

Transportation expenses represent 14% of total expenses. However, almost 60% (58.58%) are investments in boats and outboard motors and 39.8% of earnings have been spent in buying fuel. The cost of fuel, boats and motor in particular, are high, therefore these prices can be increasing the percentage of this category. Nonetheless, it is important to notice that the increase in motor boats and fuel can also have an eventual impact for Lake Rimachi's environmental health. Kandozi fishermen argued that "fish get scared with the sound of motor boats".

Table 6.4: Percentages of general expenses by expenditure category

Expenditure Category	Expenses (S/.)	% of Total expenses	# of People	% of People
Education	90.0	0.18%	1	1.54 (13)
Food	483.5	0.98%	22	33.85 (7)
Service	822.0	1.66%	9	13.85 (11)
Durable goods	1371.5	2.77%	8	12.31 (12)
Daily goods	1396.0	2.82%	33	50.77 (6)
Health	1442.0	2.91%	13	20.00 (9)
Savings	1755.0	3.54%	12	18.46 (10)
Credits/Loans	2920.0	5.89%	22	33.85 (7)
Household supplies	4366.5	8.81%	50	76.92 (3)
Alcohol/Sodas/Candies	4643.0	9.37%	42	64.62 (4)
Transportation	7340.0	14.81%	41	63.08 (5)
Fishing and Hunting supplies	10662.0	21.51%	52	80.00 (2)
Clothing and Accessories	12285.5	24.78%	55	84.62 (1)
Grand Total	49577.0	100.00%	65	100.00%

It is worth noting, that 33% of interviewees spent money on food (Table 6.4). However, these costs were so little that the percentage of total expenses did not reach 1%. Other interesting cases are in health and education, which in theory are also basic needs like food. Twenty percent of the people spent money on medicines and health care, which represents almost 3% of the total expenses. Education notwithstanding only represents 0.18% of the expenses and only one person bought something related to education costs.

Expenditures on health were done by people who had a health care need at the moment of selling their fish. The person (15 years old) who had education expenses was a secondary student, who was studying in Ullpayacu, where students have to go to school with a uniform. So, this boy spent his money buying his school uniform. Food items were products such as sugar, bread and rice. The amounts of these products were very little per family, hence they will last only for a week approximately. Therefore, a question that comes out from this data will be if a Kandozi is fulfilling his/her food needs with

products acquired in the market or from the environment directly?

Expenditures by Categories by Age. The people spent their earnings first on clothing and accessories, then fishing and hunting supplies, in third place are household supplies and as a fourth category alcohol, candies and sodas (Table 6.5). However, these expenditures by categories have some differences when analyzed by age. For these calculations a record of a person of 40 years old was excluded, because he was the only Kandozi who bought products to sell. He spent 1050 soles (more than 80% of his earnings) on beer, because he wanted to sell it in his community and also to other communities.

Both Table 6.6 and Figure 6.2 show that people between 13 and 20 years old, spent more than 35% of earnings on clothing and accessories and almost halve of it was spent in fishing and hunting supplies. The group of 21 and 30 years old had a more balanced pattern of expenses. The amount of money invested in clothing and supplies is very similar to each other. People older than 31 years spent more money on fishing and hunting supplies than in clothing. When analyzing these numbers in more detail, other differences are notable. In the youngest group, clothing is for same person who is fishing and selling the catch, while the elderly buy clothing for their wife and children and less for themselves.

Expenditure on alcohol, sodas and candies also varied between age groups. Younger Kandozi spent almost 14% in this category. People between 21 and 30 years old spent only 3.28% and older Kandozi 7.22%. Another important difference is in transportation, where young people spent almost nothing, and people above 21 years old have invested around 20% of their earnings in this category. It is interesting to see that people older than 31 years old have not bought any DVD players, radios or other durable

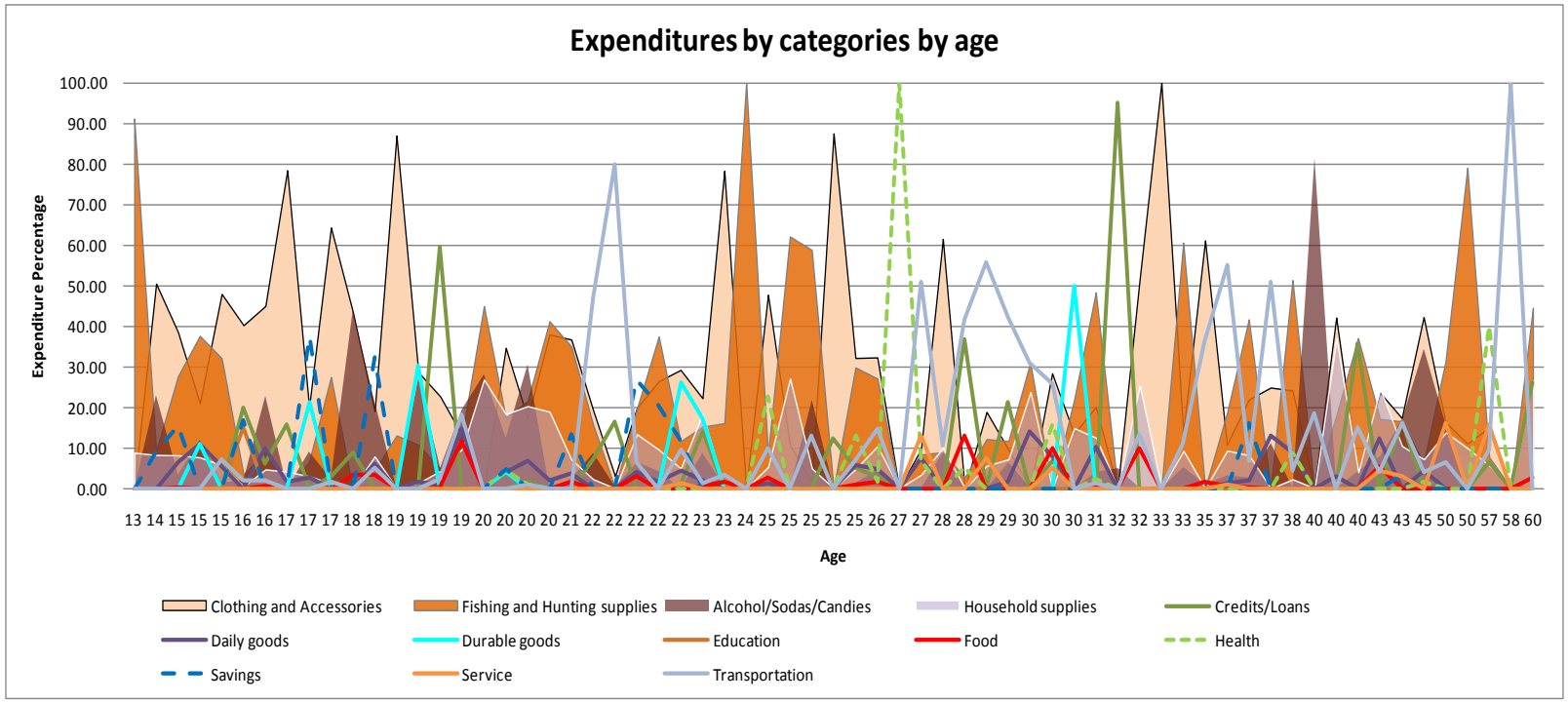
goods. And only Kandozi below 20 years old spent money on education.

Table 6.5: Expenditure by categories by age

Expenditure Percentages	Group Age 13-20 (20 people)	Group Age 21-30 (24 people)	Group Age 31-65 (20 people)
Clothing and Accessories	36.57%	21.90%	20.08%
Fishing and Hunting supplies	17.86%	21.95%	26.10%
Alcohol/Sodas/Candies	13.77%	3.28%	7.22%
Household supplies	8.37%	8.05%	10.99%
Credits/Loans	6.07%	4.39%	8.25%
Savings	5.55%	4.34%	0.94%
Durable goods	4.43%	3.88%	0.00%
Daily goods	3.77%	2.76%	2.27%
Transportation	1.61%	21.21%	17.90%
Health	0.74%	5.23%	2.02%
Education	0.67%	0.00%	0.00%
Food	0.59%	1.37%	0.89%
Service	0.00%	1.62%	3.36%

These income and expenditure data provide insights about how the Kandozi use their cash income in daily life. If these data continue to be gathered in the future, expenditure trends could be revealed. Differences among Kandozi from different ages have been observed above; however no statistical analysis can currently be done about the significance of those differences. Nevertheless, interview data correspond with these results. Elderly Kandozi mentioned all the time that young men like to buy radios, and more nets. Women also complain that men buy too much beer and that before they used to drink only *masato*, but at present they like also to drink beer in celebrations.

Figure 6.2: Expenditure by categories by age



Nonetheless, it is interesting to see that although the Kandozi mentioned that they have new needs, such as education and health, they do not spend money on those. Only one Kandozi bought his school uniform. Money on health was spent only in the cases where a Kandozi was sick at the moment of fishing. They did not spent money buying medicine for the future. They did not save money for health. People who said that were saving money, they saved because they already had a purpose for that money, and none was for health care.

6.3. CONCLUSION AND DISCUSSION

The Kandozi people, as other indigenous people in the Amazon and around the world (Godoy *et al.* 2005; Huanacuni Mamani 2010; Pyhälä *et al.* 2006), need to maintain the natural resource base as their basis for their livelihoods, both for food supply and for income generation. But in order to be able to use these resources they need to secure access and control of them and their territory (Leach et al. 1999). Access to their territory is important not only for the provision of a greater variety of resources over the year for livelihood, but also because it strengthens Kandozi's identity by exercising their spirituality, communication and education based on ancestral traditions. For example, some palm swamps are important for rituals as boys come of age (Surralles 2009). All of these need to have a foundation resting upon clear and well defined governance principles (Kofinas and Chapin 2009).

The Kandozi also need to have good social relationships for support and reciprocity that encompass conflict resolution mechanisms among the Kandozi and between them and mestizo people. In addition they need to have authorities and legitimate leaders who are well respected and who have the capacity to manage goods and services within the Kandozi territory (as natural resources) and outside the territory

(when they have make requests for education and health care services). Leaders also need to be able to participate in decision making processes that affect their population and exercise governance principles (Grafton 2005; Kofinas 2009; Kofinas and Chapin 2009). However, with the increase of market activities of Kandozi fishermen, more conflicts among fishers have appeared, and this situation have eroded social relations, hence affecting the notion of "vivir tranquilo", as is happening elsewhere (Huanacuni Mamani 2010).

The Kandozi also need to have access to education and health care services given by the state as a complement to their traditional systems of health care and intercultural education. With these, their quality of life related to health would increase, either because of disease control or because health emergencies are taken care of. In education, the Kandozi expect to have young Kandozi professionals going back to their communities to help them develop under their own ideals but capable of competing with other realities of the country, as happens elsewhere in South America (Godoy et al. 2005).

All these needs and expectations cannot be met only with monetary income or with the increased extraction of natural resources. Analyzing Kandozi's income data it is notable that they do not depend on income to provide food to their families or other needs. However, still unknown is the effect that these earnings are having on Kandozi's well-being. Studies from China (Wang et al. 2006) and about indigenous groups around the world (Godoy et al. 2005), show how people can use income, they did not have in the past, to buy alcohol or tobacco. These expenses not only will directly affect health, but also will impede spending money on basic needs.

In the Kandozi case in January 2009, data shows how people are spending money on alcohol, candies, and sodas. In addition they are buying products such as sugar, bread

and other food items that they did not use before, and the effect of these products, including alcohol and candies on Kandozi's health is uncertain, but likely to be negative. For the Kandozi people, as with for example the Mosquitia in Nicaragua (McSweeney 2004), health is directly related to quality of life and to "vivir tranquilo". Therefore, the question here would be how much are the Kandozi people improving their life with income from resources extraction? Are they creating new needs that are not related to living well?

Examples of clashes between different forms of production exist in the literature (Angelsen and Luckert 2004; Hvalkof 2006; McGrath et al. 1993; Nietschmann 1973; Schmink and Wood 1987; Smith 2002; Watts 1983). One of the classic examples of conflict between capitalist and pre-capitalist economies is the work done by Michael Watts in Nigeria (1983). He shows how a new production relation appeared among Hausa people when the land was commoditized. This resulted in a disruption of the balance between peoples' subsistence and consumption, which could caused famines. This balance, for example, was broken because of "the creation of new wants [and] the introduction of new use-values" (p.273). Another question in the case of the Kandozi would be if younger Kandozi are developing new values? Are they buying more luxury items because of new wants? Will the environment sustain these new needs of cash income?

Another example is given by Nietschmann (1973) and the Miskitos in Honduras. By contrasting both economic rationalities, market and subsistence, Nietschmann contends that a market economy has unlimited wants with limited means of production, while people under subsistence economies will have the opposite - limited needs and unlimited means. Nietschmann showed how new market relations brought opportunities

for Miskitos to trade with outsiders. Consequently, they started to expand their traditional practices for fishing, hunting and gathering, using new practices that went beyond subsistence levels.

New values and needs of local people will create new challenges for them to fulfill those needs and wants. This challenge is not easy, because these values and needs also change over the years and depend on the local, regional and global context (Kahneman and Krueger 2006). So, well-being is not static. But in order to identify these new needs, trends for the future and possible solutions, historical studies are needed. McSweeney (2004) presented how the Mosquitias changed their consumption pattern along two centuries. However, the Kandozi lack this type of information and it will be useful for future studies to start gathering economic data, especially in a time where the Kandozi are increasingly entering in market relations. This information would be useful to identify adaptive management strategies that the Kandozi will need to have in order to meet their needs from the use of their natural resources.

The Kandozi are not the only ones facing this challenge: there are other groups in the same situation. One of the consequences of this global situation is the growing discussion about a new paradigm for living well (Acosta and Martínez 2009; Carpio Benalcázar 2009; Huanacuni Mamani 2010). However, this discussion is so complex that it needs to have feedback from different types of knowledge and experiences around the world. One single culture does not have all the answers, because the pressures from the markets and from events such as climate change are global and will have different effects depending upon local contexts.

But despite the notion of well-being or quality of life, people need to have sustainable livelihoods toattain their well-being (Adger 2006; Ellis 2000; Plummer and

Armitage 2007b). Nonetheless, a livelihood is considered sustainable by Allison and Horemans (2006, pg. 759) if

> "people are able to maintain or improve their standard of living related to well-being and income or other human development goals, reduce their vulnerability to external shocks and trends, and ensure their activities are compatible with maintaining the natural resource base".

Therefore, it is important, as recommended by some authors (Berkes 2007b), to integrate studies of ecosystem management with human well-being. However, this task is not simple. It needs a complex coupled systems thinking in order to find ways of linking social and ecological systems for sustainability (Berkes 2002; Berkes 2006; Folke et al. 2002; Scoones 1998). The next chapter analyzes the Kandozi socio-ecological system and links it to the fulfillment of well-being.

CHAPTER SEVEN

The Sustainability of the Kandozi Socio-Ecological System

7.1 INTRODUCTION

According to one definition of sustainability (Chapin *et al.* 2009a), people need to meet their present needs, without compromising future generation's needs, in order to sustain their well-being. But well-being is a valued-based concept that includes several dimensions, such as having access to ecosystem goods and services, freedom and choice for livelihood decision-making, human health and good social relations (Kittinger et al. 2010; Kofinas and Chapin 2009; Millennium Ecosystem Assessment 2003). Difficulties for measuring sustainability have been related to these conflicting visions about well-being and the different values that exist to define it (Chapin *et al.* 2009a). However, less has been said about the challenges for measuring sustainability that originate in the changing nature of the needs that are to be met. In this case, the Kandozi needs are dependent upon history, gender, culture, age and a dynamic environment.

Through analysis of the trajectories of change of access to fish and timber, this study contributes to show that the sustainability of the Kandozi SES is relative to the moment at which it is analyzed. If a SES is investigated when the people are governing access to and using natural resources without compromising the ecological viability of the resources, and in addition if people are benefiting according to their own standards of well-being, then the SES can be seen as sustainable. But this situation can change in a short period of time. Consequently, sustainability is best analyzed with an historical perspective. Results may only be valid for the moment at which it is analyzed or for a particular natural resource.

Historically, the Kandozi people have benefited from natural resources. As a

society that is based on natural resources, the availability of resources and having access to natural resources are critical elements for their subsistence. Fish and timber provide different benefits to the Kandozi. Fishing for example contributes not only with food, but has also to learning processes of cultural practices and interactions with the environment. In the past, fish and timber have supplied with means for subsistence only, but in the last four decades the Kandozi have also received monetary income from them.

Chapter six showed how the Kandozi people have obtained benefits from the use of fish and timber, according to their own definition of benefits. However, at present not all of them are meeting their needs and therefore not all the Kandozi are experiencing what they perceive as well-being. Fulfillment of needs is dependent on history, local and regional contexts, and personal circumstances, plus the values that determine what a person wants and needs to meet his/her well-being. Consequently when analyzing access to natural resources it is important to be aware that although people can be acquiring tangible benefits as food and money, these "benefits" may not be contributing directly to well-being. It is also important to understand that people change their perceptions of benefits and well-being constantly. These findings on access and well-being demonstrate the changing characteristics of the Kandozi social-ecological system, and why I conclude that the sustainability of the Kandozi SES is relative to the moment of analysis.

In order to show how the question about the sustainability of the Kandozi system can be answered through an access framework, this chapter first describes trajectories of access to fish and timber within a time frame of six decades, synthesizing data from this project with information from other sources. After this descriptive section, it analyzes sustainability by evaluating how the fishing and timber systems gain and maintain access to resources over time.

7.2 TRAJECTORIES OF ACCESS TO FISH FOR THE KANDOZI FISHING SYSTEM

Events such as the creation of a fishing reserve, the establishment of communities, or the launching of the fishing law have had an impact on how the Kandozi govern access to fish in their entire territory (Figure 3.4). Next is a description of how these main events have affect the factors shaping access to fish by the Kandozi people. Analysis has also been done to identify certain resilient characteristics of the Fishing system that could help the Kandozi people to sustain access to fish over time.

The Fishing Reserve

Before 1945 no one was responsible for regulating or enforcing fishing rules in the Kandozi territory. According to elderly Kandozi interviewed in 2009, they had access to all their resources in their entire territory, meeting their livelihood needs. As they remember, fish were abundant and they shared their resources among their "brothers", referring in this case not to their relatives, but to all the Kandozi people. Access was limited only by the spatial and temporal availability of fish, and in relation to the ability of fishermen to catch the different species with artisanal fishing technology. A 76 year old mestizo called Juan, who was born in a small town near the Kandozi area and who was interviewed for this research in 2009, told me how he entered the area (referring to Lake Rimachi and other small lakes) to fish and hunt with his father when he was young. He remembered that they (his family) had access to fishing and hunting without restrictions and they also exchanged products with the Kandozi. He said that during that time the Kandozi were very few and rarely went to Lake Rimachi; they remained in the upper lakes. He said also that the Kandozi often died from diseases or because they killed each other frequently. The Kandozi did not used to go outside their territory; the mestizos were the ones that entered the area. He also said the Kandozi lived "like savages", and

communities did not exist. I confirmed this claim with anthropological studies (Monnier 2005).

On the 19th of November of 1945 the Peruvian fishing service of the Ministry of Agriculture established a Fishery Reserve in Lake Rimachi with an area of approximately of 810,548 hectares (according to the Supreme Resolution # 1231) (Ortiz 2003). As a consequence, the fishing authorities installed a control base operated by "Piscicultura del Oriente Peruano" (POP), a governmental institution that later was transformed into the Fishing Ministry. This was a top-down measure to force conservation of fish stocks in Lake Rimachi. Five mestizo custodians hired by POP, lived at the base of the Fishery Reserve located in what today is the community of Musa Karusha. They were governmental employees who were in charge of enforcing fishing prohibitions and preventing mestizo and Kandozi people from fishing in Lake Rimachi for commercial purposes. The Kandozi were unaware of these governmental fishing regulations; nonetheless their enforcement by custodians limited access to fish by the Kandozi people beginning in 1945.

Juan, the mestizo interviewed in 2009 for this research worked as a custodian between 1947 until 1951. He mentioned that during the Reserve time the Kandozi people were a scattered small population that did not fish intensively. They did not know how to use nets, but they did know how to fish with hooks and harpoons. Because fish (all kinds) were abundant, it was easy for them to be caught. Due to the hard conditions that the custodians experienced living at the base during the decades of the 40s and 50s, they also had to fish Lake Rimachi in order to survive. Because of the remoteness of the base, they did not receive food provisions regularly from the regional base in Iquitos. According to this custodian, who clearly recalled dates and events, sometimes the Kandozi people also

shared part of their fish with them. He said that they allowed the Kandozi to fish for their subsistence in their lakes.

Juan was a witness of the start of the Summer Institute of Linguistics in the study area. He described how the Institute entered the area after the first five years of the Reserve and started to create communities. So, he saw how the Kandozi started to group into communities and how they changed the dispersed and isolated way they were living before. Juan remained living in the area after he finished working for the POP, so he also was a witness of the entrance of fisherman Pedro Tuesta into the Kandozi territory. He mentioned during the interview that in 1956 commercial fishing activities by mestizos intensified with the arrival to the area of Pedro Tuesta, in spite of fishing restrictions. Tuesta was the first fishermen who used fishing nets and other more intensive fishing gear in Lake Rimachi. He was able to catch large amounts of fish and to sell them in Iquitos. He also taught the Kandozi how to use modern hooks and nets and since that time, the Kandozi started to fish more intensively in Lake Rimachi and increasingly started to acquire additional non-traditional fishing gear. The Kandozi have been able to get larger volumes of fish due to the use of fishing nets. The Kandozi also started to have more access to cash income from fish sales and from patronage relationships that were put in place during that time. But only the few Kandozi who could communicate in Spanish had access to credits and commercial activities in the area. But although only a few Kandozi had credits, the greater number of the people did not have troubles in having access to fish and other resources. Probably an evaluation of the Kandozi sustainability at that time would have been positive, especially because of the abundance of resources that existed in their territory.

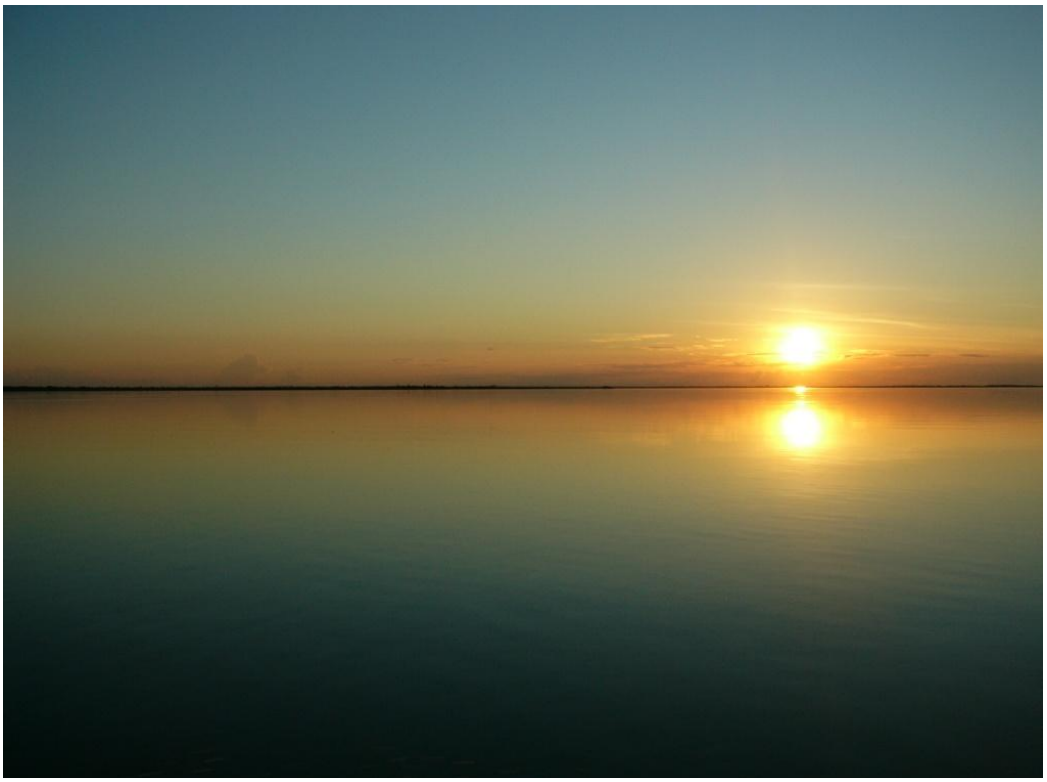
Military control

By 1965, General German Rosas declared Lake Rimachi (Illustration 19) as an area reserved for the military base in the town of Barranca, located on the Marañon River, near the mouth of the Pastaza River. The military headquarters at Barranca had to provide other army bases with food located near the border of Peru-Ecuador. Thus, the objective of General Rosas of controlling the Lake Rimachi was to obtain from there all the fish that the military needed to feed troops in the northern Peruvian Amazon. After two decades of POP custodians, for the next 10 years Lake Rimachi was put under military control. However, during the time of POP's control, fishing prohibitions were only loosely enforced, because of the limited control capacity of custodians and due to the presence of powerful commercial fishermen, such as Pedro Tuesta.

During the time of military control, not only was fishing restricted, but hunting was also. The Kandozi could not transport meat or other forest products to the city through Lake Rimachi. According to elderly Kandozi, they had to catch and transport fish during the night to avoid military control and they also had to hide other products such as animals' hides. The military staff at Musa Karusha had a greater capacity to enforce prohibitions and to limit the Kandozi from having access to resources. However, according to elderly Kandozi who were interviewed in 2009, commercial fishers on the contrary could sell their fish to the military. The speaking of Spanish was important at that time, because Kandozi able to communicate could have access to cash income through patronage relationships that persisted in the area. Although it was difficult for the Kandozi to acquire resources to sell, they had not only enough subsistence means, but they also employed different mechanisms (social and cultural) in order to have access to cash income resources. Consequently, at that time they had all the conditions to be a

sustainable system.

Illustration 19: Lake Rimachi



Fishery Ministry control

In 1973 the Barranca military headquarter was closed and the Fishing authority, the Fishery Ministry by then, took back control of the Rimachi Fishery Reserve for 17 more years. One guard called Alfonso, who worked for the 17 year period of control, was interviewed in May 2009. He mentioned that at some point there were 40 mestizo people guarding the Reserve, but at Musa Karusha they were no more than eight people at a time. The others patrolled other areas in the Kandozi region.

The guard Alfonso remembered also that by the time he was working for the Ministry, five communities had been established: Puerto Barranquito, Puerto Chingana,

Puerto Requena and Puerto Belen. He mentioned that market pressures from mestizos existed and the Kandozi had had greater contact with other mestizos from Ullpayacu and San Lorenzo. Alfonso explained how patrols not only controlled fishing in Lake Rimachi, he also had to patrol the Chapuli river up to Puerto Barranquito. The Kandozi were exchanging products for merchandise and money with the mestizo people. So, Spanish knowledge was becoming more important to these relationships, as was also stated by Pablo (see chapter five). But they were still unaware of fishing regulations, prices and therefore the patronage relationships between mestizo and Kandozi were disadvantageous for them, according to Kandozi leaders.

The fishing legislation at that time banned fishing paiche if the specimen was less than 1.60 meters long. People were also prohibited from commercializing animal hides and meat. So, guards had to enforce these regulations. The way the guards operated was by confiscating the products from the Kandozi. The guards kept 50% of the confiscated product (small paiches, skin or meat) and the Kandozi could keep the other 50%. By the eighties, the fishing law allowed the Ministry to give fishing permits to mestizos. As a consequence of these changes in governmental rules, large vessels of mestizos were entering into Lake Rimachi to fish. The reduced capacity of the Ministry for controlling and enforcing regulation caused the overexploitation of the Lake. The Kandozi at that time did not have vessels or significant amounts of nets, hence they were fishing only with artisanal gear, such as arrows and hooks (see Table 5.7) (Illustration 18).

But the perception of the Kandozi about this situation was different according to anthropological studies done by Surralles (2007). For the local people, Ministry of Fishery officials allowed commercial fishing in the area, while receiving bribes in exchange. It is difficult to know if this was true or not. Alfonso did not mention this

behavior, but he did remember that during that time a large boat ("motonave") named Elena, entered into Lake Rimachi to fish paiche. He remembered when in only one day this "motonave" caught 60 paiche individuals and 80 kilos of boquichico. However, he mentioned that these large boats had the Ministry's authorization. Even commercial fishermen such as Pedro Tuesta had permits from the Ministry of Fishery according to Alfonso. This situation caused the decline of fish stocks in the lake, claimed the Kandozi. In fact, Alfonso was doing his work, confiscating products from the Kandozi because they did not have a permit and he was allowing commercial fishing by people who held a fishing permit, granted at the office in far-off Iquitos. Fishing regulations were causing overfishing and reducing availability of fish for the Kandozi. The law caused unsustainable use.

The drop of fish population from Lake Rimachi was evident by the end of the eighties, according to interviews in 2009, other authors (Surralles 2007; UNICEF 2005), and informal conversations from 2002 to 2006 between Montoya and other people in the area. This situation seriously affected the Kandozi, not only because of their reliance on fish for subsistence, but also because of their fisheries-based cash income economy. The perception of fish decline and the governmental control that dominated the Kandozi for decades led to confrontations at the Lake Rimachi between the Kandozi and the state (Surralles 2007).

Kandozi control of Lake Rimachi

In August of 1991 the Kandozi people confronted representatives of the fishing governmental authority and took back control of Lake Rimachi. Proud of themselves, the Kandozi told the story in 2009 of how people from every community gathered in Musa Karusha in order to expulse the Fishery Reserve's guards and recover control of the Lake.

They mentioned during interviews that the organization of the Kandozi people from different communities and their coordinated work with other organizations, such as AIDESEP, was critical for the expulsion of guards. See Box 6 in Chapter Five for detailed explanation of the organizational process that was key to the recovery of access to the lake.

With anger and frustration the Kandozi justified this action because ministry officials were permitting commercial fishers to over exploit the lake's resources, while prohibiting them from fishing there. Furthermore, the Kandozi felt that they had been excluded for decades by the Peruvian State from all development programs. Other Kandozi people added that this confrontation was part of a process of land vindication. This protest was later supported by President Alberto Fujimori. By the end of 1991, President Fujimori went to Lake Rimachi to fish (his favorite hobby) but he hardly could catch any at all. The Kandozi people took this opportunity to explain to Fujimori what had been happening with fishing authorities who were overexploiting the lake. As a result, Fujimori told the Kandozi that "it is not possible to evict the owner from their own house" (Ortiz 2003) and gave the Kandozi a document (hand-written) where he recognized the Kandozi as owners of the lake. Since these initial conflicts in the early 1990s and through 2004, the Kandozi people did not have any further contact with personnel from the Fishery Ministry. The Kandozi were in control of the Lake, at least during the first three years.

The collective action that the Kandozi took to recover the control of Lake Rimachi was directed by multiple levels of organization (see Box 6), Kandozi's perception on natural resource abundance, and legal frameworks (see Chapter five). Leadership was another critical element for this collective action process. All the

Kandozi who were interviewed in 2009 about this event, remembered how respected was Sundi Simon, the Kandozi leader who promoted this event. Sundi knew the Kandozi people, and knew that they wanted to recover access to their resources within the territory. Everybody trusted him and assumed that he was acting in the benefit of all the Kandozi. In addition, Sundi spoke Spanish, so he could communicate with AIDESEP and other organizations that could assist them. At the same time, he was very eloquent in Kandozi meetings, where he convinced all the Kandozi communities to come together, despite some internal conflicts. He was the most important Kandozi leader at that time, according to interviewees. Sundi was also promoting the recuperation of the control of their entire territory by titling individual communities. So, during those years, land titling was important not only for securing access to the whole territory, but to individual communities (García Hierro et al. 2008) and for social cohesion.

During the three years of control after the takeover, they did not fish for commercial purposes. They established their own rules for no fishing during that period of time. Thus, a common access system was operating at the Rimachi area, where mestizos could not fish. Fish stocks recovered and they perceived again abundance. However, progressively mestizo fishers started to take advantage of the Kandozi's need for monetary income. Mestizos were also very interested in Lake Rimachi because of its new abundance of fish. It is worth mentioning that a fishing authority who was interviewed in 2009 mentioned that fishing governmental guards were afraid of going to the Rimachi area (between 1991 and 2001) because of the confrontation at Lake Rimachi which happened in the early 1990s. But he recognized that the Kandozi did a great job in protecting and recovering their fish stocks during the three years after the takeover the Lake.

Mestizos increased commercial fishing activities with the Kandozi by the second half of 1990s. The Kandozi were still unaware of fish prices. It is uncertain if the Kandozi knew fish regulations. But regardless fishing restriction, the Kandozi started again to ask for loans from mestizo fishers to buy new fishing gear, motor boats, salt, and other items that they needed in order to fish for larger volumes. The Kandozi were prompted by mestizos fishers to catch more and then to sell all of their catch to them. New *habilitación* relationships were established between mestizos and Kandozi, partly as a result of new Kandozi needs. As consequences of this increase of fishing intensity, the Kandozi ended up in debt with fishers. In order for the Kandozi to pay the mestizos back, the Kandozi had to catch larger quantities of fish, selecting the more valuable species (see Box 7). A strong patronage relationship was established between mestizo fishers and Kandozi fishers by the end of the 1990's.

Decades ago, the spatial and temporal heterogeneity and the knowledge of the environment were the most important factors shaping access to fish by the Kandozi. It was an open access system. However, with the intensification of fisheries, with modern technology, with the entrance of mestizos into the area all year long, and with new acquired needs, these factors are less important and as a consequence, the Kandozi and the mestizo people have access to greater amounts of resources. The problem is that they were not leaving fish to recover from exploitation and stocks were being negatively affected. Because resources were affected, sustainability of the system might have been threatened, however, new access rules were developed and additional factors started to shape access to the common access system.

Access to fish by the Kandozi during the nineties was mediated by the technological capacity of each Kandozi, which also depended on their capacity to obtain

money or credit to buy nets. It also depended on their ability to negotiate with the mestizos and what prices they could agree on. Although communities were already established, they did not restrict fishing activities yet to the Kandozi. However, people from Musa Karusha started to charge a fee to mestizos who wanted to enter the Kandozi territory to fish. This fee generated conflicts among the Kandozi who saw this situation as unfair, because they felt that Lake Rimachi was for all the Kandozi but only people from Musa Karusha were benefiting from this charge.

Fishing contracts were also a way of gaining access to fish, especially through earnings from fishing. The Kandozi obtained money from mestizos by allowing them to fish in Lake Rimachi (see Chapter Six). However, not all the Kandozi agreed with this way of fishing, because not all of them had the ability to negotiate contracts, and also because this way of fishing hurt stocks due to the fishing intensity and lack of control. This situation started in the mid nineties. Particular kin groups had more access to markets, due to proximity, ability to speak Spanish, *habilitation* relationships, and power of some of the members who were members of FECONACADIP or had a position within a community. As a result of all this chaos, lack of control and lack of enforcement of any local rules, conflicts among the Kandozi started to be evident. All of this undermined the relations of trust, cooperation, and reciprocity among the Kandozi. Self interest started to prevail. Consequently fish stocks started to be affected, as some Kandozi recognized during interviews. They began to see fewer paiche and gamitana and had to invest in more fishing effort to catch enough. All these changes show the dynamism of the access process and the diverse interactions among the different factors that vary over time.

Fishing contracts, *habilitación* relationships and fee charges to mestizos were all activities considered illegal by existing legal fishing frameworks in the nineties. But all of

them were reactions from the Kandozi to maintain access to fish and the cash income from it. Governmental fishing authorities knew that this situation was taking place in the Pastaza area; notwithstanding they had no presence in the area, hence no fishing rules were enforced in that area. This situation lasted until 2002. But during this time, relations among the Kandozi were undermined, with limited internal rules enforced, which seemed to be an unsustainable system that would led fish stocks to critical states.

Fishing co-management in Lake Rimachi

An international conservation NGO with an office in Peru (World Wildlife Fund - Peru) started to work in the area in 2001 with the goal of conserving its biodiversity. When WWF-Peru learned about the cultural diversity of the area, they partnered with an indigenous rights NGO (Racimos de Ungurahui) and with AIDESEP to contribute to the well-being of the local people. One of the conservation strategies of these organizations was to improve fishing conditions for the Kandozi people, conserving at the same time fish stocks in Lake Rimachi and surrounding areas. Therefore, attempts to establish co-management in Lake Rimachi were made by the NGOs, by facilitating the process of bringing fishing authorities and Kandozi fishermen together. The rationale was that with co-management mechanisms in place in the area, the Kandozi would have better economic conditions without threatening fish stocks. They could fish less amounts and be more sustainably (e.g. not capturing fish with eggs) if they enforced fishing laws, if they could have access to better prices, and if they could commercialize fish directly to the markets, avoiding *patrones* and middlemen.

Leveraging from my past work experience, it appears that the process to establish co-management mechanisms in Lake Rimachi was not easy. The Kandozi people did not want to have governmental control back in the area. But at the same time, they did not

want to be exploited by mestizo fishermen. They also knew that the fee they were charging to mestizos was technically illegal and they did not have any legal security for their territory, including Lake Rimachi. So, they agreed with the NGOs that they needed to develop a new mechanism to secure their land, they needed to maintain access to fish resources and its benefits, and they needed to find ways to exclude mestizos from fishing in the area. There were some Kandozi groups nonetheless who were uncomfortable with the presence of the NGOs, because they knew that with the establishment of co-management mechanisms, they would have to stop charging the entrance fee to the Lake or otherwise alter their behavior. However, for some other Kandozi, especially the elders, this situation was one of the motivations for regulating and achieving equitable access to fish and its benefits by all Kandozi. Finally, the Kandozi decided in a general assembly to accept working together with the NGOs in 2002 to improve management of fisheries in their territory. This was the second time that they decided to self-organize to conserve fisheries, however this time they were supported by external organizations and in co-management with the governmental fishing authority.

By following governmental fishing regulations, the NGOs promoted the creation of an artisanal fishing association, called Yungani (for details on this process see Chapter five). Although it may be repetitive, it is worth mentioning that this process was important for the Kandozi in terms of gaining access to information on fishing technology, fishing regulations, fish conservation measures, commercialization, markets and other types of information. But it was not a unidirectional process. The Kandozi knew the area, their organization, their culture, the environment, biological and ecological processes, among others, and therefore they participated and helped with the elaboration of the management plan, and the entire process of co-management. They

made the decisions regarding management mechanisms with the assistance of the NGOs. For example, it was very important to combine local knowledge with scientific knowledge in the zoning of Lake Rimachi. Spawning areas were identified by both types of knowledge and were established as no-fishing zones (Figure 2.9).

The establishment of Yungani in addition favored access to fish by the Kandozi by formally delegating governmental control to the Kandozi fishers and by excluding mestizos from the area. Thanks to the process of creating Yungani, numerous meetings took place, in which the Kandozi decided collectively on fish prices, no-fishing zones, fishing gear and agreed on other local rules, which at the same time were in accordance with the national fishing law. In those meetings, the Kandozi also decided who would participate in the control committees and decided on where those committees would operate. The Yungani organization, the development of a management plan and the establishment of control committees where like endowments (Leach *et al.* 1999) the Kandozi had, which entitled them to govern access to fish resources and to contribute to their well-being. The Kandozi fishing SES in 2004 seemed to be sustainable, because they had access to fish which contributed to their well-being.

By 2005-2006, Yungani was operating following management agreements enforced by the control committees, with the support of the Ministry of Fishery. The Kandozi were selling their fish with better prices. Monitoring of fishing activities done by WWF-Peru showed that captured volumes of fish eggs had been reduced, contributing to the conservation of the resource and the sustainability of the activity. According to WWF's data, between December 2004 and February 2005, 7544 kilos of fish eggs were commercialized. After the Kandozi agreed not to fish during the spawning season of boquichico, these volumes were reduced. There are no data for 2006 and 2007, however

the volume of eggs that were commercialized between December 2008 and January 2009 was 2810 kilos and between September 2009 and November 2009 was 2991 kilos of eggs (Data provided by Luis Moya, WWF staff in charge of monitoring of fishing activities).

During the preparation of the management plan the Kandozi agreed not to have any more contracts with mestizos because it was not fair for everybody and especially because the mestizos had a negative impact on the resources. These agreements lasted for a period of time. But mestizo fishermen were catching paiche in the Huangana River, boquichico fish during spawning season in February and other fish with sizes smaller than the permitted. It was difficult for some Kandozi people enforce the no fishing agreements. The Kandozi saw this situation as unfair for them and some Kandozi fishermen declined previous agreements. The weakening of the compliance by the Kandozi, especially by leaders, the reduced support from the fishing authorities and the increased market pressure for fish, resulted in conflicts among the Kandozi around 2007. This situation of rising conflicts among the Kandozi and variations in Kandozi behavior show how a SES can undergo change relatively quickly. Inequity of access to fish resulted in conflicts among the people as in other places (Seixas Simao and Berkes 2003) and had an effect on the SES resilience as they reduced their capacity to respond to social and market pressures without affecting fish stocks.

Conflicts over access to fish

Even though fishing regulations (Yungani, the management plan and control committees) have contributed to the gaining of access to fish by the Kandozi people, management arrangements for fishing described in the management plan and implemented by the control committees of Yungani have also generated new internal conflicts among the Kandozi at the time of this research.

Certain groups of Kandozi mentioned during interviews in 2009 that people who were members of a control committee abuse their authority and instead of guarding the fish from deprivation, they were negotiating with mestizos to enter the area. So, this mechanism of local control is placing the control power in hands of only a few Kandozi (the guards), when before (in the nineties) this control activity was unnecessary or at least shared among all the Kandozi. Consequently, only the Kandozi who disobeyed the management plan and the internal agreements, but who were designated to enforce control, were receiving benefits from fishing. This generated a bad precedent in the area, where people who did not respect agreements was gaining access to fish. As a result, more people started to break fishing rules (see challenges of governing access in Chapter Five).

During field work in 2009, conflicts among Kandozi were also rising due to communal ownership. Some communities were allowing mestizos holding nets to fish in "their lakes" and people that are not part of those communities argued that mestizos were damaging fishing stock in the territory. There are some communities that claimed ownership or rights over resources located in particular lakes that are close-by or included within communal boundaries. They have restricted commercial fishing to Kandozi who are not kin related. Thus, the bounded group that controls fish use and have common access to fish has been reduced to a smaller group of communities, but it is still a common access system that excludes mestizos and other Kandozi from fishing in areas near them. Communities in the upper basin thus, have been seeing access restricted to fishing open areas in Lake Rimachi. Conflicts over fishing between different kin groups are generating stronger divisions among family clans, and the spatial characteristic of access reinforce this situation.

The absence of state or regional fishing authorities in the area also contributed to this concentration of power within certain Kandozi kin groups. It was surprising to hear during interviews in 2009 that some of the Kandozi were asking for the return of military control. Two of the elderly Kandozi who were interviewed in January 2009 told me that they wanted to have military control back because during that time, although they could not fish free in commercial volumes, at least they had abundant fish, and they could meet their food needs. So, they were more worried about securing access to the resource as a food source, than earning money from this activity.

Nevertheless, such was the level of conflicts among the Kandozi during field work in 2009 that they have started to search for new ways of controlling access to fish, in order to reduce conflicts among them and be more "tranquilos". They argued that they want to solve conflicts among Kandozi families because they cannot live in conflict with their families; they needed to be calm. One of the WWF's staff who was interviewed mentioned that the Kandozi were operating well as control committees but they could not do it by themselves, they needed WWF's help all the time. Because of their limited Spanish, limited understanding of the laws and the management plan and its regulation, the Kandozi were unable to convince mestizos and other Kandozi to comply with regulations. It was easy for the mestizos, according to WWF's staff (and as observed during field work in 2009), to enter the Kandozi territory to fish. They showed the Kandozi documentation regarding fishing permits and fishing contracts that the Kandozi did not understood, and consequently the Kandozi did not know how to operate.

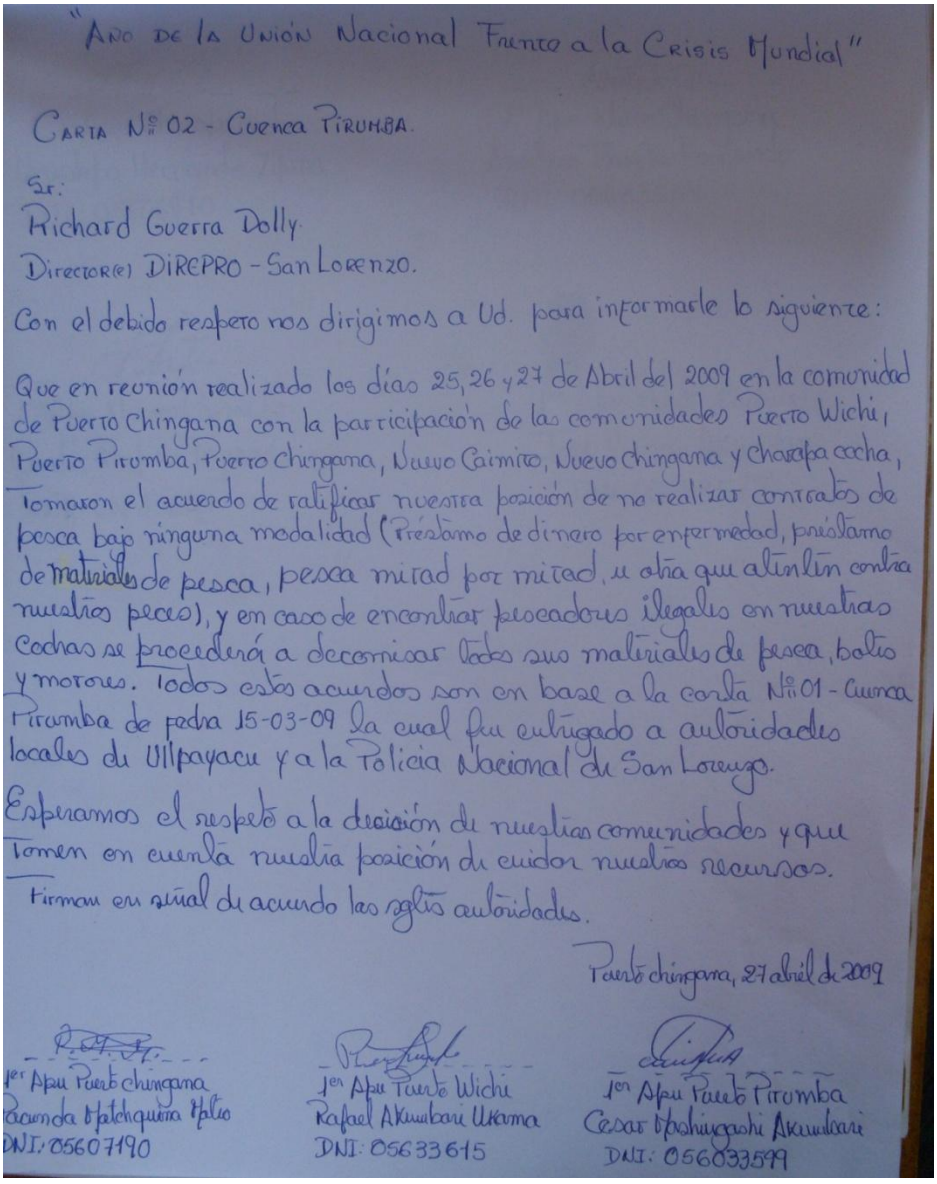
By May 2009, all the Kandozi who were interviewed did not believe that Yungani was the best management option to preserve fish stocks and to achieve well-being. They argued that few Kandozi were complying with agreements, and that the leaders were the

first to break the rules. They were angry with members of the control committees. So, the deteriorated social relations discouraged the rest of the Kandozi from continuing with Yungani and the management plan and the fishing SES appeared to be broken and probably unsustainable under current conditions. However, Kandozi people from some communities started to organize alternatively control mechanisms, without any WWF or other NGOs' intervention, in order to preserve fish stocks in their fishing areas and aiming to reduce conflicts among them and have calm again. This shows how the Kandozi people are responding to social, economical and cultural changes to the SES.

Communities from the Pirumba basin and communities that were included in the title of Huambracocha, decided independently to organize themselves and to control "their lakes". Puerto Chingana and the rest of the communities located in the Pirumba River decided to alternate control activities among them and patrol their areas. They did not want to have mestizos within their lakes. They did not ask for help from WWF or fishing authorities, however, in April 2009 they wrote to several authorities in Ullpayacu informing the population that nobody would be allowed to fish in their area, only Kandozi (Illustration 20).

Illustration 20: Letter for the Fishing authorities in San Lorenzo

(Brief summary of content: Illustration 2 is a letter from the apus of communities from the Pirumba basin to the director of the fishing authority in San Lorenzo. With this letter, the apus informed the director that they had a meeting in April 2009 in which they agreed to ban fishing contracts between Kandozi people and mestizos. They also stated that if they find mestizo fishers within their lakes, the Kandozi will confiscate all fishing gear and boats. They explained that they reached this agreement in order to take care of their resources).



"Año de la Unión Nacional Frente a la Crisis Mundial"

Carta Nº 02 - Cuenca Pirumba.

Sr:
Richard Guerra Dolly
Director(e) DIREPRO - San Lorenzo.

Con el debido respeto nos dirigimos a Ud. para informarle lo siguiente:

Que en reunión realizado los días 25, 26 y 27 de Abril del 2009 en la comunidad de Puerto Chingana con la participación de las comunidades Puerto Wichi, Puerto Pirumba, Puerto Chingana, Nuevo Caimito, Nuevo Chingana y Charapa cocha, Tomaron el acuerdo de ratificar nuestra posición de no realizar contratos de pesca bajo ninguna modalidad (Préstamo de dinero por enfermedad, préstamo de materiales de pesca, pesca mitad por mitad, u otra que atinlin contra nuestros peces), y en caso de encontrar pescadores ilegales en nuestras cochas se procederá a decomisar todos sus materiales de pesca, botes y motores. Todos estos acuerdos son en base a la carta Nº 01 - Cuenca Pirumba de fecha 15-03-09 la cual fue entregado a autoridades locales de Ullpayacu y a la Policia Nacional de San Lorenzo.

Esperamos el respeto a la decisión de nuestras comunidades y que Tomen en cuenta nuestra posición de cuidar nuestros recursos.

Firman en señal de acuerdo las sgtes autoridades.

Puerto chingana, 27 abril de 2009

1er Apu Puerto chingana
Jacinda Matchiquiña Matio
DNI: 05607190

1er Apu Puerto Wichi
Rafael Akumbari Ukama
DNI: 05633615

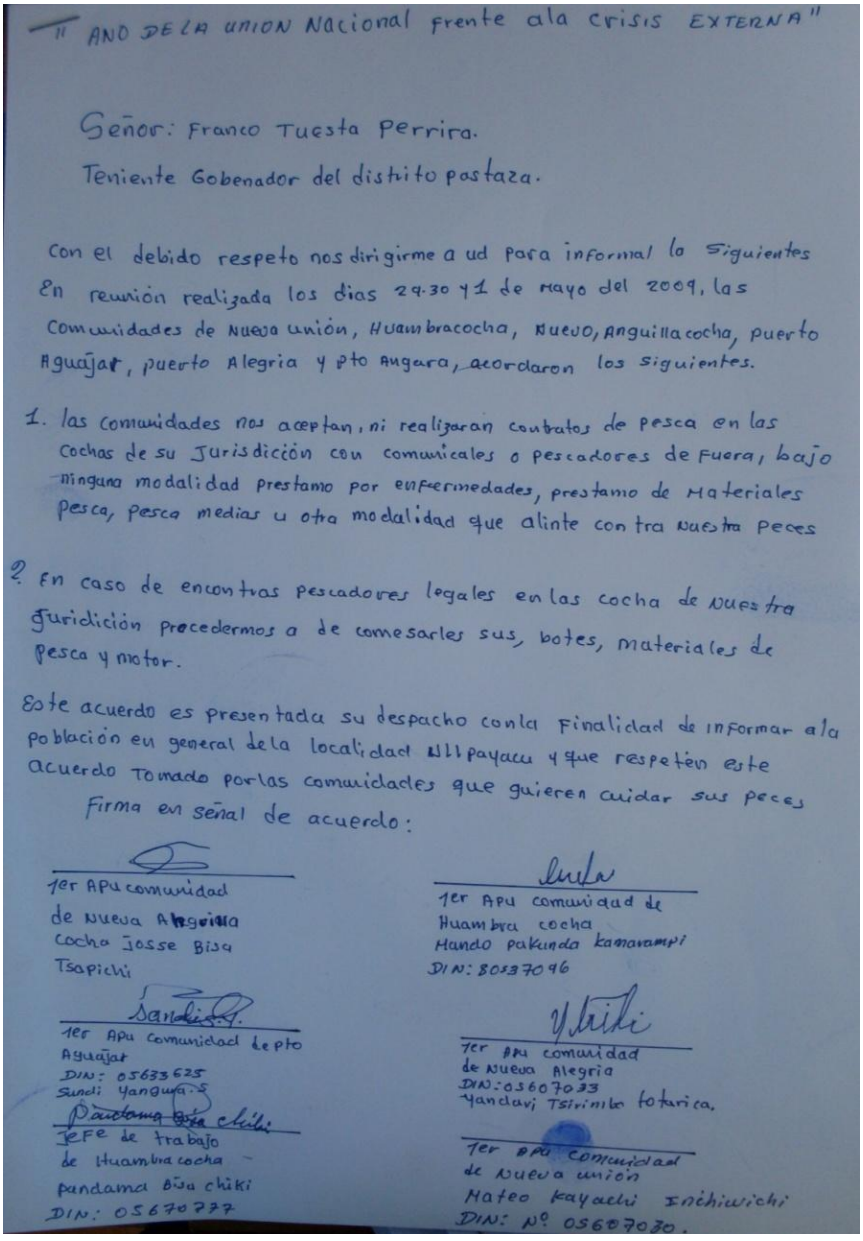
1er Apu Puerto Pirumba
Cesar Mashingashi Akumbari
DNI: 05603359

Similarly but in a different process, people from Nuevo Union organized the communities that had kin relationships with them, such as Huambracocha, Nuevo Aguajal, Anguilla cocha and others (see Figure 5.14 in Chapter five). They claimed that they have exclusive access to some lakes (see Table 5.14 in Chapter five) so they decided to control these lakes. Nuevo Union invited all the apus from the kin communities and the day after the invitation all of them gathered in Nuevo Union. I was coincidentally at Nuevo Union in 2009 at that moment and I was a participant observant of the process. They discussed for hours in the Kandozi language and by themselves. Neither I nor WWF's staff participated in the meeting. After the Kandozi were done discussing management arrangements and control strategies, they invited me and WWF's staff to listen to their agreements. They mentioned that they want to exercise the control, because they did not want to have mestizos under contracts within their territories. They disliked Yungani because its members were not enforcing the agreements and were not complying with the rules. So they had to look for other management alternatives in order to maintain access to their resources and prevent them from overfishing. During the meeting in May 2009, WWF's staff suggested the Kandozi follow Pirumba's example of sending a letter to the authorities in San Lorenzo. Illustration 21 shows a picture of the letter sent to the Governor of the Pastaza District (Teniente Gobernador) in which the Kandozi communicate that they will not allow mestizos in their area and they did not want to have fishing contracts any more (Illustration 21).

The above section showed how the Kandozi SES resilience can be studied through the analysis of access to natural resources. The Kandozi adapted to a new situation (chaos and eroded social relations) and looked for mechanisms for governing access to fish, increasing the benefits from fishing.

Illustration 21: Letter to the Teniente Gobernador of San Lorenzo.

(Brief summary of Illustration 3: This is a letter from the apus of six communities from the Chapuli River to the Governor of the Pastaza District. The apus stated that they have agreed in a meeting in May 2009, to stop issuing fishing contracts with mestizos. If the Kandozi fishermen find a mestizo fishing within their lakes, they will confiscate his fishing gear and boats).



"AÑO DE LA UNION NACIONAL FRENTE ALA CRISIS EXTERNA"

Señor: Franco Tuesta Perrira.
Teniente Gobenador del distrito pastaza.

Con el debido respeto nos dirigirme a ud para informal lo Siguientes En reunión realizada los dias 29.30 y 1 de mayo del 2009, las Comunidades de Nueva unión, Huambracocha, Nuevo, Anguillacocha, puerto Aguajat, puerto Alegria y pto Angara, acordaron los siguientes.

1. las comunidades nos aceptan, ni realizaran contratos de pesca en las Cochas de su Jurisdición con comunicales o pescadores de Fuera, bajo ninguna modalidad prestamo por enfermedades, prestamo de Materiales Pesca, Pesca medias u otra modalidad que alinte contra nuestra Peces

2. En caso de encontras pescadores legales en las cocha de Nuestra Juridición procedermos a de comesarles sus, botes, materiales de pesca y motor.

Este acuerdo es presentada su despacho conla Finalidad de informar ala población en general dela localidad Nuevo Payacu y que respeten este acuerdo Tomado porlas comunidades que quieren cuidar sus peces

Firma en señal de acuerdo:

1er APU comunidad de Nueva Alegria
Cocha Josse Biya
Tsapichi

1er APU comunidad de Huambra cocha
Nando pakunda kanawampi
DIN: 80537096

1er APU comunidad de Nueva Alegria
DIN: 05633625
Sandi Yanguma S.

1er APU comunidad de Nueva Alegria
DIN: 05607033
Yandavi Tsirimbo Toturica.

Jefe de trabajo de Huambra cocha
pandama Biya chiki
DIN: 05670777

1er APU comunidad de Nueva unión
Mateo kayachi Inchiwichi
DIN: Nº 05607030.

It is worth mentioning that in both cases, Pirumba and Union, two Kandozi men were still well respected by others. In both cases these communities still had leaders that were respected not only within their own community, but also within the kin group, at least. These leaders promoted in each case and independently the same strategy to control fishing within their lakes. Because of kinship, they mentioned that they thought they could solve their problems on their own. They could not keep living in conflict because they aspire to live calmly, in peace with their relatives.

This could be considered a third time of self-organization. Nonetheless in this case, self-organization process took place by two different groups of communities and not with the entire Kandozi group. The size and composition of the groups involved in self-organization were also different. It was a different scale of organization; it included a group of kin communities associated also by geographic location that share common fishing grounds. However, both cases could be considered sub-systems of the Kandozi fishing SES, consequently these cases helped with the analysis of the Kandozi SES sustainability. This last situation of self-organization took place in May, during the last field research trip to the area, therefore what happened afterwards, cannot be included in the present document.

7.3 Evolution of Access to Timber within the Kandozi System

Similar to fishing, the timber system is part of the whole Kandozi system, consequently same events and other more timber-related events have had an effect on how Kandozi people govern access to timber. The following section uses an historical analysis of access to timber to understand how it has evolved over the last six decades. It also identifies social and environmental characteristics of the system that make it resilient to all these events.

Access controlled by few loggers

This sections draws on Chapter Three and Five, on the interviews in 2009, and also on conversations, workshops and focus groups done since 2002 by myself through my previous working position at WWF-Peru. The Kandozi people remember how before loggers went into the Kandozi territory, they only used trees for building canoes. The Kandozi economy did not depend on timber extraction for their livelihood. They built a canoe every year or two years and a house every five to six years, so they did not need to cut trees often. And furthermore, they did not use tropical cedar for those activities. They could find abundant game, birds and saltliks of animals in the forest. All the Kandozi had access to the resources and the resource extraction areas; however they were unaware of the existence of markets and the commercialization process of timber. First encounters with rubber tappers were in the 1920's, and it was then when the Kandozi started to extract trees from their forest. By the first half of the 1930's the first logger came into the area. During that time, they had abundant cedar trees and the loggers traded merchandise for trees.

A couple of elderly Kandozi men from the Chapuli River and two mestizo traders about 70 years old clearly recalled how the Kandozi territory was covered by highly valuable tropical cedar trees that were exploited under very unfavorable conditions (for the environment and for the Kandozi) when they were young and then approximately between the 1960's and 1980's. These testimonies coincided with declarations that deception was the modus operandi of loggers. During that time, the Kandozi had to give the logger ten logs in exchange for one shotgun or for a box of cartridge bullets (valued at no more than US$10.00). The situation did not change significantly until late in the 1980s according to them and also younger Kandozi. The Kandozi had physical access to timber,

nonetheless they did not have access to the monetary benefits of its use. Benefits were mediated by the loggers. The Kandozi are not sure when they began to receive money from timber extraction.

There was only one well known logger between the sixties and the seventies. Eduardo Rojas was the one who started in the area in the sixties and worked with Kandozi timber for 10 years. In the seventies Romulo Vivanco went to the area and stayed there for a couple of years. In the eighties, more loggers started to enter the Kandozi territory to extract timber, hence greater pressure on forestry resources at that time. Greater pressure on resources was exercised not only because of the increased number of loggers, but also it was a consequence of new technology used. Logs before the nineties were manually extracted by the Kandozi and a few workers of the logger. They used only axes, machetes and by the end of the eighties, sawmills.

Another pressure to the forest came also from the arrangement of resource extraction areas. By the eighties, communities were formed and timber extraction was done at the communal level and not dispersed in the Kandozi territory as before. So, some areas received more extraction pressure from loggers. The demographic configuration, community location and size and the local environment were important factors that determined where timber extraction would take place. Access to timber was spatially configurated.

By the eighties, the Kandozi had learned that they could obtain cash income or merchandise in exchange for timber. So, they started to cut trees by themselves. Usually a household cut two or three trees and the communities in total could reach 30 trees approximately. Once the 30 logs or so were ready to be transported in the rivers (Illustration 16), the apu with other households went to Ullpayacu or San Lorenzo and

called their *patrones* to sell them the timber. There was usually one patron for each community. So, differently from fishing, since the early decades the Kandozi started to extract and commercialize products as a community, and although each household would receive the money that would correspond to the amount of trees extracted, the entire process and the decisions related to it were done collectively within the communities.

No governmental forestry control existed in the area, according to the Kandozi people. However, local rules about how many trees would be cut, who would be the patron, and from where would the Kandozi extract the trees, were enforced by all the members of the community. Not even the apu of the community had the power to decide on this, because they made the decisions together. So, although they were receiving little monetary benefits from timber extraction, because of the very low prices paid by the loggers (between 0.10 and 0.30 soles per board foot), at least they had some decision-making power of this activity and could control among the Kandozi how much each household extracted. In addition, relations of reciprocity were important, because they had to help each other with log transportation and extraction. This process reinforced the idea of communal organization and how access can be gained through communal decision- making processes. Kinship is also an element that is usually strong within Kandozi communities (because of the way they had been formed, see Chapters Three and Five), and that facilitates reciprocity and trust among the Kandozi. Thus, timber extraction is a common access system, controlled by single communities. Rules are enforced and consequently the Kandozi can secure access to timber, contribute to their well-being and apparently the system can be considered sustainable.

Intensification of timber extraction

During the nineties, more mestizo workers came into the area with the loggers and

the situation did not change dramatically compared to the past. In 2000, Johnny Perez started to work in the area and to bring more sawmills to the area with him. And because transportation of logs was too difficult and required too many people, Johnny and other loggers such as Antonio Amiel and Alejandro Morey started to also use tractors. The use of tractors and more sawmills allowed the loggers and therefore the Kandozi to have access to larger volumes of timber, but at higher costs (Table 7.1). The relationships among them were still under the *habilitación* system. The logger decided on prices, and together with the Kandozi decided on the amount of logs they would cut. But this time the logger not only paid very low prices, but charged the Kandozi 75% of the production costs. The logger offered higher prices for logs (1.3 soles per board foot) but at the end of the process, after he had estimated timber volume he paid only 25% of the production to the Kandozi. Consequently, the Kandozi seldom benefited monetarily from timber extraction.

Table 7.1: Timber extraction and loggers in the Kandozi territory

Period	# of Logs	Logger
1988	370	Antonio Valcarcel and Luis Chávez
1998 – 2000	420	Jorge Cardenas
2000 – 2002	850	Johnny Perez

By the 2000's more than ten different loggers began to commercialize timber from the Kandozi territory. Each one had different prices and different working conditions, but all of them lacked forestry permits, or other legal mechanisms to commercialize timber. Control could be exercised among the people within the same community, but no one could control people from a different community. Little by little, boundaries and community titles became important for the Kandozi in order to establish

their extraction area. Titles were also important in relation to larger processes of land security and for preventing oil companies from working in the area (see previous chapters). So, whereas the communal boundaries was not important in the past decades and were not important for fishing yet, it was key in determining how much timber people could have access to.

The first national forestry and fauna law (promulgated in 1975) promoted timber extraction in harmony with social interest, which meant that it was aimed to avoid inequitable trade and patronage relationships. However, the Kandozi were unaware of the existence of laws or any timber extraction regulation. The lack of governmental presence, the remoteness of the area, and limitations with the use of the Spanish language, did not allow the Kandozi to learn about laws that could help them with a more sustainable and equitable activity. Consequently they were essentially giving away trees to loggers under a system of patronage, with more losses than gains. So, access in terms of benefits was limited or even nil.

The forestry and fauna law (No. 21147) from 1975 was modified into the current law (No. 27308) approved in 2000 during the neoliberal government of President Alberto Fujimori. This law promotes forestry activities based upon respect for indigenous people's rights and establishes a set of requirements that had to be met in order to commercialize timber from indigenous communities. Nevertheless, the Kandozi remained unaware of the legal framework that established their rights and obligations regarding timber extraction until approximately 2002 or 2003. However, the logger knew of this legal framework and knew what was needed for this activity (see Box 2). As a result, the logger indirectly reinforced the need of having titled communities and communal agreements in order commercialize timber.

In the past decades, titles were not as crucial as they are today in shaping access. The Kandozi territory and resources were open access to all the Kandozi people, as mentioned before. Titles were delineated without thinking in terms of gaining access to resources. People wanted to have a title in order to secure the entire territory. However, over the years the Kandozi started losing their initial will of securing their territory as a whole (García Hierro et al. 2008). As a consequence, communities that applied for a title more recently, have tried to include larger areas of the entire Kandozi territory, especially timber areas and lakes. Furthermore they attempted to include ecosystems with a greater variety of resources, including timber.

This has generated un-equal access situations, in which communities have titles that incorporate greater areas of territory for only a few people living there. Musa Karusha for example is a community on the lower portion of the Kandozi territory, near Lake Rimachi, that when they delineated their boundaries of the title and submitted to the Ministry of Agriculture, they incorporated an upper sector that includes important amounts of timber areas. This has not happened with other communities which were titled during the 1990's. During that time, the title was not as relevant as it is today to control resources. People then were claiming titles with the goal of having a single title for the entire Kandozi territory. Titles of larger areas have given more power to certain communities because they can control bigger areas and they can access strategic resources for income generation. However, conflicts over forest areas have been solved in almost all cases with help of FECONACADIP.

As in the case of fisheries, this analysis of access over a longer period of time shows the different factors that shape access to timber. The analysis also contributes with better understandings of how the factors that shape access operate at different moments

and how they vary the way they interact among them, depending upon the time of analysis and the social, economic, and political context. This approach helps with the study of sustainability by linking this evolution of access to the needs that can be met from timber extraction.

Access governed by the Kandozi

In 2002, when WWF-Peru started working in the Kandozi area, they did several meetings and visits to the area to learn, among other things, about the forestry activity. They learned about the abuse by loggers of the Kandozi and the un-managed extraction of timber in the area. I was part of this process of learning and had the opportunity in 2003 to hear how the Kandozi people reacted to WWF's concern about their forest. In a workshop in Puerto Unguri with people from different Kandozi communities, I as part of WWF was telling the Kandozi people that if they continued extracting timber as they were, without reforestation activities and management criteria, receiving few benefits and instead having debts with the loggers, they will over-exploit their forest, affecting in addition wildlife. The Kandozi made light of this concern, because they argued that they had plenty of trees and that they had never run out of them before. In addition, they said that it was the only way they had to obtain credits and cash when needed. This was especially true for communities in the upper basin, such as Puerto Unguri. However, when WWF started to show the Kandozi real prices of timber, to teach them methods of estimating timber volumes and explained to them all the legal implications of the way they were doing timber extraction, they decided they wanted to learn more. So, WWF started to cooperate with them on this topic.

Some apus and Kandozi leaders knew about the legal framework, but requirements for timber extraction were so difficult to achieve for a Kandozi community

that they could not comply with the law on their own. Loggers took advantage of the complexity of enforcing the forestry law and continued commercializing under unfair conditions, as they had for decades. The lack of governmental presence and limited capacity to control timber extraction helped loggers to continue with this modus operandi. In addition, the growth of Kandozi communities in the last years was an opportunity for loggers to have more agreements with these new established communities and as a result they could gain more area to have access to timber resources, while the Kandozi were losing their trees.

Fortunately, the Kandozi did learn more about timber extraction. They realized that they could earn more money from it if they comply with minimum management considerations. They could also have a less damaging activity for the environment if they followed forestry management regulations. So, by 2005 they started to agree in different meetings that they would stop extracting timber until they learned more and had better conditions. Nonetheless, this cessation did not happen until 2008. Most of the communities had logs ready to be transported, so they decided to sell all that they had already cut and then stop. Others could not stop because they had to pay debts with loggers. In addition, this decision was something that resulted from meetings organized by WWF where all the communities were together, instead of being based on the decisions of the individual communities that extract timber.

However, during the field work for this research, it was interesting to listen to the Kandozi people express a different perception on tree abundance. I had the opportunity in 2009 to talk to some of the same individuals with whom I talked in the meeting in 2003. This time, these Kandozi people and others who were interviewed told me that the trees were now farther from their houses. They used to consider the forest as their bank, but in

May 2009 they felt that they were finishing their bank account. They accepted in May 2009 that trees are also finite resources and that they have to take care of them. Some of the Kandozi were asking themselves what they would do if they do not have trees for the future. How would they build their canoes or houses, or where would the animals go? How would their children build canoes and houses? They even asked what would happen if they needed money and they did not have trees to sell. This is similar to the case of the Tawahka in Nicaragua, where the Tawahka people use their forest as their natural insurance (McSweeney 2005).

As explained in Chapter five, the Kandozi expelled loggers from the area in 2008, not only when they learned about prices, regulations and all of these, but especially when they realized that they would have no more access to the resource in the future. Timber was perceived as declining and therefore, they decided as individual communities to halt timber extraction. This was not done in a general meeting. Each community individually started to exile loggers or just did not allow new loggers in their communities anymore.

It is important to take into account that every community has a president or an apu, and if the people do not trust this person or do not see him as a leader, they have the power to change him. Therefore, in all cases, all the communities had at least one person who was a leader and who could lead the decision on halting timber extraction, after the Kandozi felt the threat of losing their trees. And despite the fact that the Kandozi are individualistic (Ribeiro and Wise 1978), in this case access to timber was governed at the communal level.

No governmental control was allowed in the area; in fact forestry authorities were also exiled from the Kandozi territory. Kandozi communities in addition, did not coordinate any decision with the federation, CORPI or AIDESEP, as this was decided

exclusively at the communal level. Local control was not needed either. Each community has its own mechanism of control that varies from one place to another, but at the end, they have their own mechanisms of enforcing local rules and decisions. In this case in addition, access was more fair within communities, because people still share labor and gear to cut trees and commercialize timber and because all the decisions are made by all together. However, because of the spatiality of access, there is still un-equal access to forestry land by people from different communities.

7.4 Analysis of Sustainability

Ecosystems, such as those found in the Kandozi territory, are characterized as extremely dynamic (Ferreira Valle and Stohlgren 1999; Kvist and Nebel 2001; Nebel et al. 2001; Puhakka et al. 1992; Thieme et al. 2007). Its ecological processes and its spatial and temporal heterogeneity affect natural resources availability. The Kandozi, nonetheless, have learned to live in this changing environment for centuries. Thanks to the knowledge they have about their environment, and the strategies they have had to cope with these constant changes, they have been able to maintain access to natural resources and to persist in fulfilling their changing needs over time. In my opinion, this means that the Kandozi SES has been resilient and sustainable to environmental natural changes and ecosystem dynamics for centuries. However, in the past (five decades ago and more) the Kandozi's needs were mainly related to having access to resources for food, shelter and spirituality. Changes in values and the local economy can reduce the SES resilience as has happened elsewhere in the Amazon (Seixas Simao and Berkes 2003).

The local economy has changed in the Amazon region; mestizos and indigenous people are more profit-oriented at present. According to information gathered for this

research (see Chapter Six), the Kandozi's needs have also been changing as a result of external disturbances to the SES (e.g. changes in local economy) and the Kandozi's own cultural values (e.g. degree of respect to leaders) and relationship with nature. As shown in Figure 7.1 well-being in more recent times, depends on the fulfillment of more needs, such as (occidental) education and health. This has a direct impact on the sustainability of the SES, since it requires people be able to meet their own needs (past and newly acquired needs) (Chapin *et al.* 2009a). If these needs are increasing over time, then the capacity of the SES to adapt to these internal changes requires new mechanisms that respond to this dynamic. The sustainability concept then is problematic and seems to be an illusion since it consists in constructing a well-being which is based on changing needs.

Figure 7.1: Social-ecological system dynamics, evolution of Access and well-being

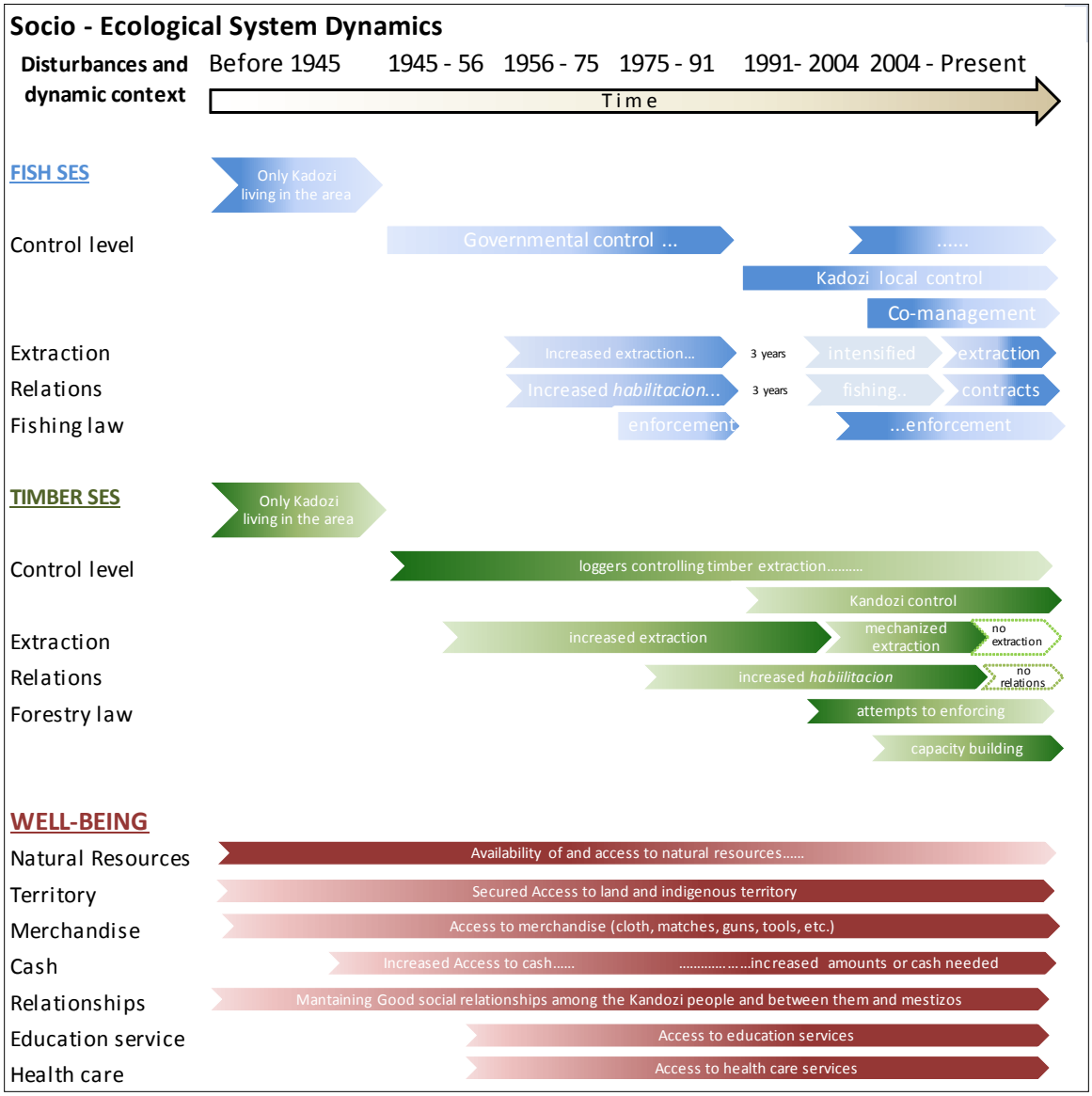


Figure 7.2: Social-ecological system dynamics, evolution of Access to fish and well-being

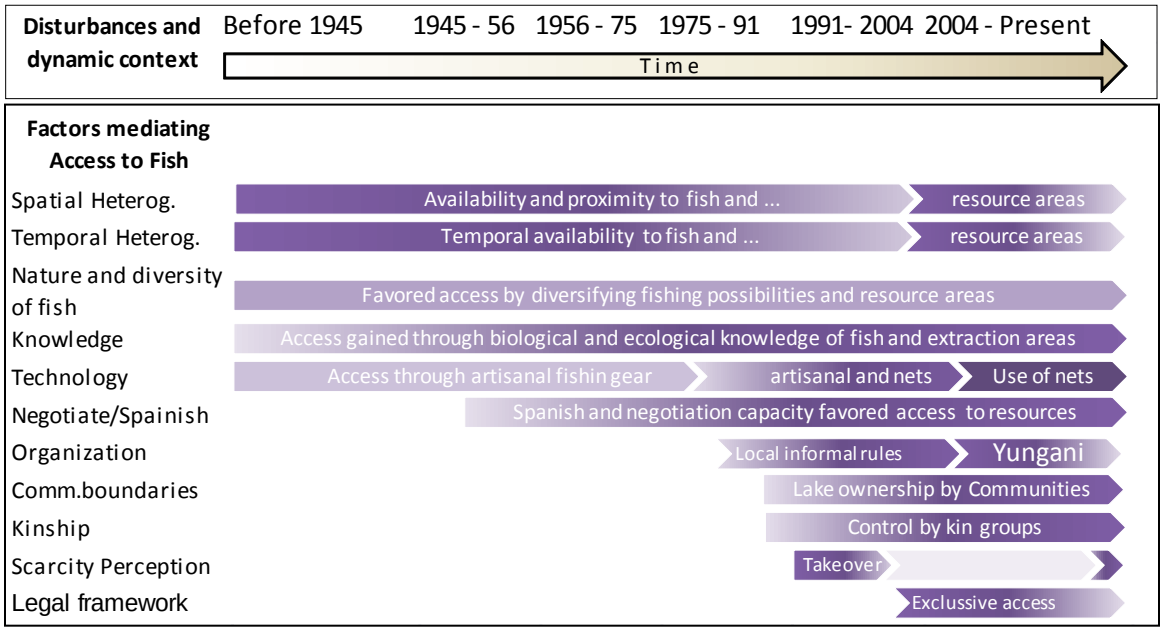
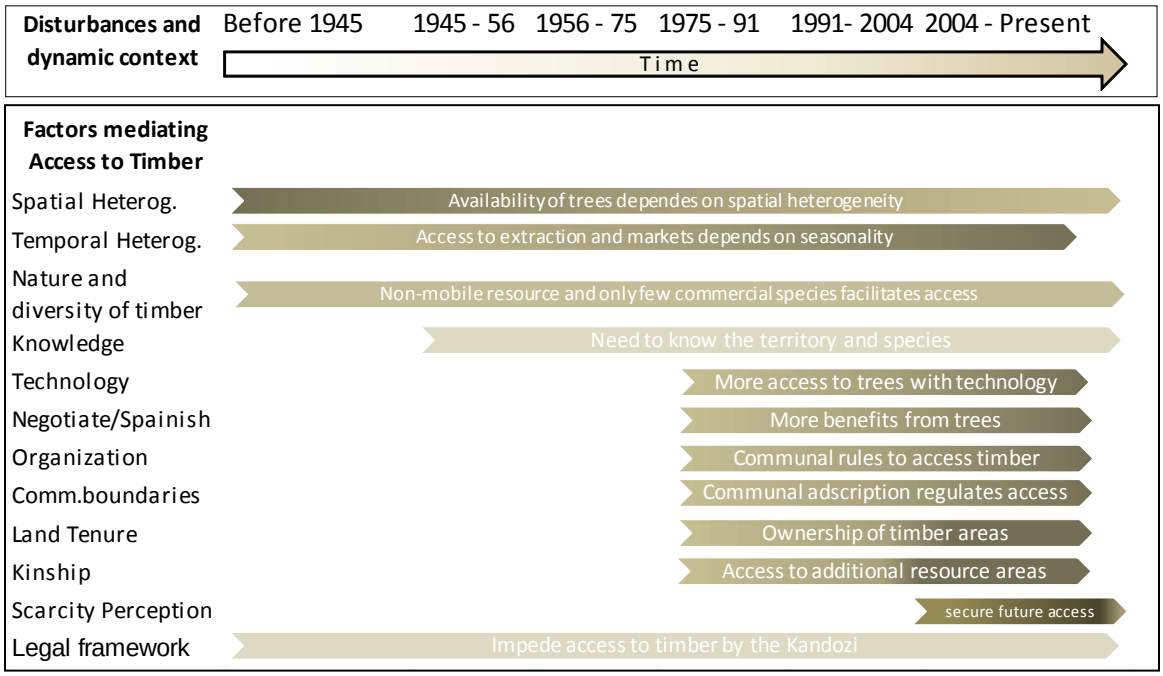


Figure 7.3: Social-ecological system dynamics, evolution of Access to timber and well-being



In addition to changes within the Kandozi SES and their perceptions on well-being, the Kandozi SES also has been experiencing other processes (Figure 7.1) that have affected the economic, social, ecological and political context in which the SES operates. In the Kandozi case, some of the disturbances were specific events such as the establishment of the Fishery Reserve (Figure 3.4). But these events originated processes that can be considered perturbations to the SES that also varied in degree over time. For example, the governmental control of fisheries activities in Lake Rimachi started with the establishment of the Fishery Reserve; however its enforcement varied over time (Figure 7.2). During the seventies, government employees efficiently controlled the lake, however in the nineties guards were expelled, hence their absence resulted in a lack of control of fishing activities. This changing context of the SES, together with the changing needs of the Kandozi (Figure 7.1) have created a complex situation that requires a flexible system able to maintain access to natural resources, in order to attain its well-being.

Access factors that affect social-ecological resilience

The analysis of the links between access and resilience done by Langridge (2006) in communities in the Russina River shows the multiple mechanisms that systems use to maintain and control access to water, and how those mechanisms are link to resilience. Similarly, Seixas and Berkes (2002) showed in Brazil various factors that strengthen and weaken social-ecological resilience. Both studies performed qualitative analysis of data gathered through interviews, archival research, and participant observation with an historical view of processes of resource use. Although these studies analyze SES and disturbances with a different theoretical framework, the mechanisms of access to resources found by them are shared with the results obtained in this study. For example,

they suggested that technology, authority and knowledge, among others are elements related to the resilience capacity of an SES (Langridge *et al.* 2006; Seixas Simao and Berkes 2003; Seixas Simao and Davy 2007).

The present study also shows the diversity of mechanisms that mediate access to fish (Figure 7.2) and timber (Figure 7.3) and how they vary over time. In the case of fisheries, Figure 7.2 shows how some of the factors found to shape access in Chapter Five operate at different times in history. Environmental heterogeneity for example, has been a factor that has always shaped access to fish. However, this factor becomes less important when fishing technology changes and when the Kandozi obtain fish through fishing contracts with mestizo people. Modern technology and contracts allowed the Kandozi to fish more intensively, in spite of the season, and due to the presence of mestizos all year long, the temporal availability of fish is not such a restriction any more to have access to fish. Other studies have mentioned the importance of technology in decisions regarding what to fish and in defining rules of access (Begossi 2001; Martin 2001; McGrath *et al.* 1993). Nonetheless, the spatiality characteristic of access does not change. Similarly, kinship relationships in the past were not as important as they are today in shaping access to fish by the Kandozi and by other groups in the Amazon (Lu 2001, 2007). With the establishment of communities, with the enforcement of legal fishing frameworks, as well as new management local arrangements, kinship has been determinant in who can have access to and control over fishing grounds (see Chapter five).

In the case of timber production, the situation is similar (Figure 7.3). The most notable change in access dynamics is the one related to land tenure processes. Land titling and kinship in past decades were not relevant in shaping access. However, since

the forestry law implementation, and the increased *habilitación* relationships, land titling became crucial for establishing who had access to timber. Organization and compliance with local rules are at present also important for the Kandozi in determining who has access to timber areas and trees; whereas, before the establishment of communities, organization was not needed in order to have access to trees. Although not included in Figure 7.3, it is important to mention that other events at the national or international level also had an impact in the Kandozi SES. Land titling became more important after land laws were approved nationally and also after the international indigenous movement became more influential. Other studies have also demonstrated the importance of land tenure in defining access rules (Begossi 2001; Roth 2009).

Figures 7.1, 7.2 and 7.3, which aim to be a simple depiction of the dynamic of the SES also shows that Kandozi's perception about resource abundance can shape access to fish and timber by influencing processes of self-organization. Perception of abundance is not the only factor that originates self-organization (Berkes and Seixas 2005; Dale and Newman 2008; Folke et al. 2005; Seixas Simao and Berkes 2003; Seixas Simao and Davy 2007) for governing access to fish and timber. Nonetheless, this factor was mentioned by the Kandozi people to be probably one of the most important factors that triggered self-organization processes, because the direct impact on Kandozi's livelihood and well-being. Self-organization processes have been used to evaluate the resilience capacity of an SES (Seixas Simao and Berkes 2003). Thus, it can be concluded that the factors shaping access found in this study can be analyzed in relation to the resilience capacity of the SES. And because resilience is one of the approaches used to study sustainability (Chapin *et al.* 2009a), the study of access can also contribute to this.

Self-organization processes that occurred with the Kandozi people in the fishing

and timber cases are similar to processes described in studies about management institutions (Armitage 2005; Plummer and Fitzgibbon 2004). The process of self-organization that required the takeover of Lake Rimachi, the creation of Yungani, or the process of halting timber extraction by communities and expulsing loggers, resemble the creation of management institutions in the Ecuadorian Amazon (Lu 2001). These three events can be viewed as the formation of institutions (following the Ostrom 1990 definition) that responded to external threats to maintaining access to resources. Resource scarcity situations or the perception of scarcity (Bremner and Lu 2006; Gibson 2001), and the dependency on fish or other resources for livelihoods (Futemma 2009; Gibson 2001) were also factors that originated the creation of these institutions elsewhere and in the Kandozi case.

Similar to other places in the Amazon, these new indigenous institutions that are created in response to disturbances (with or without help from outsiders) are often effective at the beginning (Bremner and Lu 2006; Pinedo *et al.* 2000; Pinedo *et al.* 2002; Smith *et al.* 2002). When the institutions are new, access to resource areas and access to natural resources are regulated by new rules that have been established by communities, groups of individuals or outsiders. However, after some period of time, these institutions are typically weakened or modified, especially when the threat has been reduced (Bremner and Lu 2006). Several studies showed how these institutions lose their interest in participating in management of resources, or self interest gains importance and rules begin to be violated (DeCastro and McGrath 2003; Pinedo *et al.* 2002; Smith *et al.* 2002) This situation generates conflicts among the local people and social relations become undermined.

This is what happened with the Kandozi takeover, for example. For the three

years after the takeover of Lake Rimachi, rules were enforced, the Kandozi people trusted each other, and fish stocks recovered. However, when the overfishing threat disappeared, people began to prioritize self interest over the common good. Conflicts among the Kandozi increased and social relations begun to be affected, among other things. Consequently, access to fish by all the Kandozi people was reduced, and only a few powerful Kandozi had better access to fish (as described in Chapter Five and previous sections). However, a decade later, the Kandozi people were organizing again through the creation of Yungani in order to recover equitable access to fish and to conserve fish stocks. This behavior has been explained by studies of institutions, that argued the non-static characteristics of institutions and their need to constantly change as a mechanisms to persist over time (be resilient) and sustainably manage their resources (Berkes 2002; Scheffer et al. 2000).

As depicted in Figure 7.1, co-management was considered a new context for the SES that has started with the creation of Yungani and the return of the fishing authorities to the area. In 2004 new management arrangements were developing in order to secure access to fish by the Kandozi, preventing mestizos from fishing in the lake. Responsibilities for control and enforcement of management rules were in theory shared by the Kandozi people and governmental officials, as ideally should be done in co-management arrangements (Cash et al. 2006; Plummer and Fitzgibbon 2004). However, co-management is not as simple as sharing responsibilities and distributing decision power between local people and the government (Armitage 2005; Berkes 2002; Berkes 2006; Folke *et al.* 2002; Plummer and Armitage 2007a; Plummer and Fitzgibbon 2004). Instead, several conditions need to be met in order to achieve co-management, including conditions such as the right legislation that promotes co-management or the existence of

leadership and trust among the participants of co-management (Cash et al. 2003; Plummer and Fitzgibbon 2004). In the case of the Kandozi fisheries in the first half of 2000, the fishing law promotes co-management arrangements and transfers control responsibilities to the Kandozi people. However, the Kandozi SES has been losing trust and leadership among its members after the enforcement of both government and local rules broke down around 2007.

In 2004, when co-management was supposedly installed, factors such as kinship, communal boundaries and land tenure began to be more important in shaping access (Figure 7.2). The Kandozi began to control fishing activities within communities, or within kin groups, because people from different communities were violating the rules. People began to claim ownership of lakes, and divisions among the Kandozi increased. Leaders also violated rules and consequently they lost other respect. Consequently, access was mediated by kin relations, community organization, community adscription, and with less importance by co-management arrangements described in the fishing management plan.

Co-management never happened with forestry resources (Figure 7.3) in the Kandozi territory. However, factors such as knowledge, organization, kinship and land tenure, helped each community gain and control access to timber. Management arrangements occurred at the communal level, and although those were informal rules, they were better enforced than the more complex mechanisms in the fisheries. Fisheries co-management was embedded in more complex interactions among fishers across and within scales (Plummer and Armitage 2007a). Communities were small entities, with their own needs, defining how to govern access, while with fisheries, communities or kin groups were not acting as unique entities. Furthermore, fishing was a more individualistic

activity.

CONCLUSION AND DISCUSSION

Through time, the Kandozi people have been responding with different mechanisms to perturbations to the SES, in order to gain and maintain access to natural resources that also depend on the nature of the resource. This dynamic process, by which the Kandozi cope with disturbances, grows in complexity as more needs are acquired by the people, more disturbances affect the system, and more factors are needed to secure access to resources. Some responses have taken more time than others, but in all cases, responses have required the combination of factors that will shape access to resources and be able to persist in time. But governing access faces several challenges described in Chapter Five. These challenges (that are in relation to the factors shaping access) such as self-interest, reciprocity and trust, technological knowledge, scale of control, among others, are similar to the factors that strengthen or weaken social-ecological resilience and build adaptive capacity, according to several previous studies (Berkes et al. 2003; Berkes and Seixas 2005; Folke 2006; Folke et al. 2003). Consequently, by studying the process of governing access to fish and timber over a long period of time, this study unveils how the factors that positively and negatively affect resilience and adaptive capacity (Langridge et al. 2006; Seixas Simao and Berkes 2003) are related to the factors shaping access. This supports the hypothesis that the sustainability of a SES depends upon the kind and quality of access to natural resources.

CHAPTER EIGHT

Conclusions

8.1 INTRODUCTION

This last chapter presents a recapitulation of the dissertation and the conclusions of the examination of how an indigenous group governs access to natural resources; how this group derives benefits from the use of resources; and how those benefits contribute to people's notion of well-being. Using an historical approach to study access, Chapter Seven analyses the sustainability of the fishing SES, the timber SES and the Kandozi SES as a whole. Sustainability conclusions are also included in this Chapter.

The conclusions are organized in two sections: major findings that are related to the research questions of this dissertation, and contributions to literature, which includes theoretical and methodological contributions that go beyond the case study used in this research.

8.2 MAJOR FINDINGS

Access to fish and timber by the Kandozi people

The factors found to shape access to fish and timber by the Kandozi people are a bundle of factors that have been grouped under environmental- spatial and temporal-heterogeneity, kinship relations, land tenure and communal boundaries, national legal frameworks and local knowledge, which includes also recent acquired skills (language, technology and organization).

Factors shaping access to natural resources have an effect on how people (individuals or societies) develop rules of access, relations of power, trust and leadership, and other processes such as self-organization that allow people to govern access to

natural resources over a long period of time, if resources are available. Resource availability is determined by environmental dynamics, such as the spatial and temporal heterogeneity of the area.

These factors do not operate independently; they are interrelated among each other. Land tenure for example, favors access to timber in particular, because the forestry law requires that commercial timber extraction needs to be done only within titled communities. Land tenure in the case of fish, is not quite relevant, because fishing regulations establish control for fish stocks, but not for areas, as in the case of timber.

Interactions among factors that shape access take place at different scales and levels. For example, the interaction between temporal heterogeneity and kinship relations favors individuals' access to fish, while the interaction between land titling and spatial heterogeneity favors access to timber by an entire community.

Depending upon the resource, fish or timber, factors can vary in the way they operate. This variation also responds to whether people are having access to the resource itself, to a resource extraction area or to the market they need to sell the product. Variations on the effects of factors over access also respond to a particular moment in time, because of changing environmental, social, cultural and economic conditions.

This study of access to two commercial natural resources by the Kandozi people demonstrated that access evolves over time. In addition it shows that several factors that shape access to fish and timber interact interchangeably. For example, five decades ago land tenure issues were nonexistent and did not influence access decisions, not only because people were just starting to establish communities, but also because there was not a national forestry law in place regulating timber extraction from titled communities. However, at present, the interaction between those factors, in addition to spatial

heterogeneity and kinship are critical in regulating how people access timber. This supports the idea that access is a multifactor dynamic process.

In addition, this case study contributed with showing the spatiality of access. Access to fish and timber by the Kandozi people varies spatially because of the heterogeneity of the Abanico del Pastaza environment. Resources are not equally distributed in the area. Consequently, spatial and temporal heterogeneity determine the availability of the resources that people need to have access to, in order to partially fulfill their needs.

This availability of resources, critical for access, varies depending upon the resource. In the case of fish, stocks will be available (easier to be caught) every low-water level season. But not all fish species will be available everywhere. People have to know where they can find particular species. But depending upon the year, fishing grounds can appear and disappear, because they depend on water levels. So the time frame for resources and fishing grounds also varies. In the case of timber on the contrary, timber extraction areas location do not vary, but its accessibility does vary in relation to water levels on rivers. But trees need a long period of time (minimum of 10 years aprox.) to be ready for timber extraction. This has an effect on what people can access, where and when.

Over time, rules of access to timber and fish have varied and this has resulted in a situation of un-equal access among different communities. The relation among spatial and temporal heterogeneity, land tenure, forestry and fishing laws, technology, organization and other factors has caused that members from different Kandozi communities do not have equal access to timber and to fish anymore. People within a titled community will have access to timber, while people from an untitled community

will not. Or, a person who knows how to fish with nets will have more access to fish, and in other moments in the year, than someone who only uses arrows.

Benefits from fish and timber

Kandozi people are receiving tangible benefits such as food, money and materials from fishing and timber extraction. They are also using fish for subsistence purposes and timber for building canoes and houses. However, those benefits are not enough to satisfy the Kandozi's well-being. Kandozi's well-being includes other elements beyond material things, such as having social relations in balance, or having the ability to make their own decisions.

At the time of the field work of this work (2009) the Kandozi people (as a group) felt that they needed the Peruvian state to provide them with education and health services. In the past, this was not considered a necessity. However, as with this example, the Kandozi are acquiring new needs that if not fulfilled may affect how they perceive their well-being. However, although in all cases needs and notions of well-being change, they can take different directions depending upon the scale of analysis and other factors.

This study has helped to show that the fulfillment of needs depends upon history, local and regional contexts, personal ambitions and values. For example, based on past experiences and knowledge, older people value having enough standing trees within their boundaries of their communities, rather than having the money from selling those trees. They are more concerned about leaving resources for future generations than younger people are. Young people are more concerned about present and personal needs, and because of less knowledge of their environment, their different perceptions about resource abundance, and their greater needs for education and other things, they think for ways to fulfill present needs that may affect the resource base.

This study also helped to demonstrate, for example, that well-being and needs also vary depending upon the level of analysis, if it is at the individual, community or the entire Kandozi group level. For the Kandozi as a group, "vivir tranquilo" was something they aspire to have, which means that as group they want to live without worries. But this notion of well-being could change if needs were analyzed at communal or individual level, partially because values change in all cases.

Despite the level of analysis, it can be concluded that well-being and what people perceive as benefits changes constantly. This changing characteristic and the historical contingency of well-being, make its study and understanding very difficult.

Sustainability of the Kandozi SES

The answer about the sustainability of the Kandozi SES is not a single simple one, and conclusions can be made about the sustainability of the fishing, timber extraction and the Kandozi as a whole. Sustainability is understood here as a dynamic process by which societies adapt to change (Berkes et al. 2003) in order to meet their needs, maintaining or increasing the productive base (natural resources) over time.

Fisheries

The Kandozi people depend upon fish for subsistence and also for cash income generation. Therefore, over the years, governing access to fish has been critical for making a living. However, the Kandozi people have experienced un-wanted external interventions to control fish and to limit access to resources within their territory. These events controlling access, together with resource decline, and resource availability uncertainty, made the Kandozi respond with mechanisms to gain access to fish.

Kandozi people's responses such as self organization to recover access and control to fish have happened at least twice in the last 60 years. And although fish

resources were declining, the Kandozi were able to recover fish stocks, in part because of the nature of fish resources and environmental dynamics.

In 1991 the process of self-organization included all the Kandozi people from all the communities. Three years after they recovered fish stocks, it can be concluded that the SES was sustainable at that time, according to the above definition. The Kandozi people were satisfying their needs, increasing the resource base.

However, in early 2000, when some fish species were overexploited, and capture of gravid fish was excessive, conflicts among the Kandozi were rising and partially because of un-equal access to fish. Only fishers who were capturing gravid fish or allowing mestizos in the area, were receiving monetary benefits from fish. The sustainability answer at that moment would have been in the negative, because the SES not only had overexploited some species, but social relations were undermined, and that is an important component of the Kandozi's well-being.

Eight years later, and after a process of building institutions for governing access to fish, with technical and financial support from the government and the state, some Kandozi families started to overexploit fish again, because they were not complying with the rules of access. Conflicts at this moment were among Kandozi families that had un-equal access to fish. In 2009, a process of self-organization took place again, but this time it was not the entire Kandozi group who self-organized. Instead people related by kin bonds started to organize to recover access to fish, at least in a portion of their territory. This was done independently by at least two different groups of communities. Consequently, in 2009 the fishing system started again a process of building rules of access, but these rules were not necessarily agreed upon among all Kandozi fishers.

Timber extraction

In the case of timber, the situation is different. First of all, the Kandozi never depended upon timber extraction for their livelihoods. The process of self organization to govern access to trees took place long after the system was not sustainable according to the definition. People were giving their trees to the loggers, were not receiving benefits from this sale, and loggers had no consideration for overexploitating forest resources.

The Kandozi however, after learning more about timber commercialization, after receiving more benefits from fishing, after they learned they were having less standing trees available within their community for their own use, and because of other factors, they decided to stop extracting timber. Nonetheless, this decision was not implemented by the entire Kandozi group as in the case of fisheries in 1991. Individual communities were the ones able to make that decision and enforced it, and not all the communities made the decision at the same time. It was a gradual process.

Thus, although all the Kandozi in the past were involved in timber extraction and all of them have in theory access to timber, in practice self-organization process were possible only at the community level, because of legal frameworks, land titling issues, timber localization and others factors explained in Chapter Five. But when I ask about the sustainability of timber extraction at present, I would say that yes, it is sustainable, because they are cutting only a few trees for building canoes, it is not a commercial use anymore and they are benefiting from this use, satisfying their present needs for transportation. They are not receiving money from timber, and they value more the keeping of standing trees for the future, rather than selling all that timber to a logger for a quick gain. That is the present situation. But here again, users from the timber system at present, are changing in structure, because they are grouped in communities to make

decisions, instead of as an entire group as in the past.

Socio-Ecological Systems

So far in this Chapter, conclusions regarding fish and timber extraction have been analyzed independently. Drawing from Ostrom's framework (Ostrom 2009), it can be concluded that the fishing system and the timber system are "single focal SES" composed of subsystems, such as fishers, rules of access, forest areas and fishing grounds. However, both Kandozi SES can be also considered part of a larger SES, composed of overlapping sub-systems of the fish and timber SES, and including other natural resources.

Following Ostrom's framework and in this case study, resource users are the same people, because all the Kandozi will fish or cut a tree in a certain moment in his/her life. Governance systems overlap, because some of the rules for access to fish or to timber are shared by all users. The resource system, according to Ostrom (2009) is a designated area encompassing a specified territory that contains different ecosystems. In this case, fisheries and timber extraction encompass the entire Kandozi territory, where people have timber areas and fishing grounds to use. Thus, the Kandozi SES would also be considered a single SES by the SES framework, where I am asking how the Kandozi people have access to fish and timber.

It can be concluded then, that the study of access to natural resources done in this dissertation, similarly to the SES framework proposed by Ostrom, has helped indentifying the "relevant variables for studying a single focal SES" (Ostrom 2009, p.420). However, I think that the SES framework is limited in explaining the interactions among the subsystems, because I consider that the delineation among the proposed subsystems is arbitrary and the access approach made these interactions more explicit (see Chapter Five and Seven) without delineating any subsystem.

But using again the SES framework and looking at the Kandozi people as a SES, can I say that it is sustainable? The historical analysis of access has demonstrated that although self-organization processes have taken place, these are occurring at different levels of spatial, temporal and organizational scales. For example, while people from Kandozi communities were selling their trees for insignificant prices and cutting trees without management criteria, the same "users" were self-organizing to take over the Lake Rimachi and recover fish stocks. In addition, "governance systems" at some point in history of the Kandozi were "congruent" with local conditions. Capturing gravid fish was banned, cutting trees in commercial volumes was banned, but then these rules varied and the SES had to adapt to these new conditions. But again, is the entire SES adapting? or are we having subsets of the subsystems (part of the users, some fish species, some fishing grounds, some regulations) adapting to new conditions?

Then again, is the Kandozi SES sustainable? I argue that the answer will vary depending upon the moment that we ask the question, if people feel that they are perceiving benefits without compromising ecological viabiligy.

As a final conclusion I would argue, that although Ostrom's (2009) framework helps with understanding SES components, it may be limited to help understand the sustainability of a SES. I have used here her example on self-organization to analyze sustainability, but it may work only for "smaller SES" and not for larger and more complex SES. In addition, the dynamism of these SES is not made explicit enough, changes are occurring all the times, at different scales, and therefore it is even harder to talk about "long term sustainability".

8.3 CONTRIBUTIONS TO LITERATURE

Theoretical contributions

This comparative study of access to fish and timber contributed with evidence of differences between the trajectories of the SE fishing and the SE timber systems. This study reveals that although fisheries management and timber extraction activities share the same people, the same area, the same political, cultural and social context, the Kandozi people have had very different strategies to govern access to the two resources.

This finding supports studies of the commons (Van Laerhoven and Ostrom 2007) as they suggest the need to study a broader array of resources and more groups of users in order to better appreciate the effects of social and historical contexts and resource management institutions linkages.

The approach to study access used in this work is different and is a contribution to access literature. Access literature often considers access a-spatial because it is assumed that the resource is available and rules of access, institutions and other mechanisms used for gaining access are analyzed without questioning resource availability (Lu 2007). And when availability of resources is considered in the study of access, the scale of analysis (McSweeney 2004; Sarkar 2008) does not allow the researcher to demonstrate the spatiality of access. Some other studies investigate access when a resource is scarce (Langridge *et al.* 2006) but this scarcity is considered a perturbation to which the SES has to respond to.

Access to natural resources has been demonstrated in this study to be a useful framework for analysis socio-ecological systems. The analysis of how access to fish and timber has evolved over time demonstrates that access is a dynamic process influenced by several interacting factors that operate at different times in different ways.

By studying access to fish and timber, it has also been possible to better understand that socio-ecological interactions among subsystems (to use Ostrom's definitions) are also in permanent change. And although the SES framework recognizes SES as complex systems with nonlinear interactions, it is not explicit about its evolution over time. And by helping to better understand perceptions on well-being, access studies can also give insights about SES sustainability.

By looking at two SES from an access perspective, this research adds to the SES framework that not only "smaller" SES can be composed of "larger" SES, but also that these systems are not hierarchical, are not mutually exclusive and are not nested. In fact, they have overlapping subsystems.

In addition, this study supports the argument that sustainability is a process (Chapin *et al.* 2009a), and expands the literature by arguing that sustainability needs to consider not only environmental dynamics, but also the social, cultural, economic and politica dynamics and that all of these will affect people's notions of well-being, which consequently are also evolving all the time. Therefore, the sustainability of a SES depends upon the moment of analysis. It is because systems are complicated, that the evaluation of SES sustainability will only be a representation of a particular moment in a particular context.

The Convention of Biological Diversity (http://www.cbd.int), the Millennium Ecosystem Assessment (http://www.millenniumassessment.org) and other studies have argued for the need to integrate natural resource management (including ecosystem management) with human well-being (Berkes 2007b) in order to achieve both goals, biodiversity conservation and meeting livelihood needs (Haines-Young and Potschin 2010). This study contributes to show that access is a useful framework to integrate both

goals.

Methodological contributions

Because of the scale used in this study (the entire Kandozi territory) and the use of a diverse and dynamic environment as a case study area, it has been possible to understand how access varies spatially and temporal.

The Kandozi case has provided the means to study a group of people dispersed in a variety of non-homogenous communities embedded in a dynamic environment that shape how they spatially and temporally access to resources.

Furthermore, by integrating the analysis of well-being and attempts to achieve it over time with mechanisms to maintaining access to resources, this study contributes with a more complete framework to better understand the challenges of reaching and evaluating sustainability of an SES.

An historical analysis of access, where processes of self-organization were identified, helped to understand that although the researcher is analyzing a SES over time, this SES may change to levels that can be transformed in a SES with quite different characteristics. The SES framework is limited in explaining when this distinction should be made. In addition, the study of access demonstrated that processes such as self-organization occurred at different scales. In the fishing system, people self-organized at several scales (the entire Kandozi group, all the fishermen, and group of kin communities), whereas in the forestry system people self-organized to gain access at the communal level. This can be problematic if fishing and timber are considered part of the same SES because of this multiple scales of responses.

This study has demonstrated that the sustainability of a socio-ecological system is more comprehensively understood if analyzed using access and well-being research

frameworks. Sustainability of the Kandozi SES depends upon access to natural resources and on the Kandozi's well-being. If the Kandozi people, who rely on natural resources for their livelihood, cannot have access to their natural resources and their environment, then they will not be able to attain well-being. If they cannot meet their needs by definition (Chapin *et al.* 2009a) they are not a sustainable SES.

Policy relevance

Through the historical analysis of access to fish this study shows that natural resource management and conservation programs need to incorporate not only environmental considerations, but also social, economical, cultural and political characteristics of the SES in order to have a flexible system able to respond to changes and contribute to its well-being without negatively affecting natural resources. So far, the fishing system has been capable, apparently, of responding to different internal and external changes, which may have contributed to its sustainability as a SES. But the future can be uncertain if these characteristics are not taken into account in conservation work.

This comparative study of access to natural resources also contributes with insights for natural resource management (NRM) and biodiversity conservation by unpacking a complex SES. This study reviews processes of co-management of fishing resources that have resulted in conflicts among Kandozi fishermen. Some of these conflicts are the result of inequity of access, power relationships, and misunderstandings of the factors that shape access to fish. If these considerations are addressed, NRM and conservation programs might be more effective, not only for conserving resources but also for benefiting the people involved.

In a variety of regions such as for the Kitui people in Kenya, the Owita agroecosystems in Sri Lanka, the Andes in Peru (Ichikawa et al. 2010), and the Kandozi territory, where the local people depend on the natural resource base to sustain their livelihoods, natural resource management is crucial for these people's well-being. However, management of natural resources worldwide faces difficult problems that challenge the sustainability of management systems (Chapin 2009; Plummer and Armitage 2007b). This difficulty can be addressed with the study of access as has been demonstrated in this dissertation.

Appendix I

Sample of questions of the semi-structured interviews for households (in Spanish)

ENCUESTA A MIEMBRO DE HOGAR Kandozi

Comunidad:			
Nombre Entrevistado:		Edad:	
Tamaño del hogar:	# esposas	# hijos	# hijas
Tiempo residencia aqui:	Donde vivía antes?:		
Por qué se mudó?:			
Cuántas veces ha cambiado de comunidad?:		Por qué?:	
¿Cuales fueron las comunidades anteriores?			
¿Sigue visitando la(s) comunidades anteriores? Si No ¿tiene familiares en ellas?			
¿En cuantas comunidades tiene familia, cuales?			
¿Pesca, caza o saca madera de las anteriores comunidades? Por qué?			
Si no tuviera familia en esas comunidades, ¿podría sacar recursos de allí? Si No			
¿Cómo se llaman los lugares donde pesca para consumo, en cada comunidad a donde va?(marcar en mapa)			
¿Por qué va allí y no a otro lugar?			
¿Cómo se llaman los lugares donde pesca para venta (o en verano), en cada comunidad a donde va?(mapa)			
¿Por qué va allí y no a otro lugar?			
¿Con quienes o cerca a quienes pone campamento?			
¿Cómo se llaman los lugares donde caza, en cada comunidad a donde va?(marcar en mapa)			
¿Por qué va allí y no a otro lugar?			
¿Cómo se llaman los lugares donde saca madera, en cada comunidad a donde va?(marcar en mapa)			
¿Por qué va allí y no a otro lugar?			
¿Ha cambiado esto con el tiempo, cómo, cuando fue mejor?			
¿Los lugares donde pesca, caza o maderea están dentro del título? Importa?			
¿Los lugares donde pesca, caza o maderea se comparten con más comunidades?			

Pesca – REGULACIONES/GOBERNABILIDAD
¿Cuánto pesca, todo lo que usted quiere?
¿Alguien regula la pesca?
¿Se controla algo dentro de cada familia?
¿El control es entre miembros de la comunidad y del Apu?
¿Se organiza usted con otros para pescar?
¿Siempre ha sido así?:
¿Está usted de acuerdo con esa forma?
¿Sabe que es Yungani, qué espera de ellos?
¿Quieres que siga existiendo, cómo te gustaría que funcione Yungani?
Pesca – BENEFICIOS
¿Quien te enseño a pescar?
¿Qué significa la pesca para un Kandozi? Qué tan importante es?
¿Quieres seguir pescando siempre o cambiar de actividad? Por qué
¿Ahora hay más beneficio que antes o igual? Por qué
¿Hay mas gente que se beneficia o son menos ahora? Por qué
¿Tienes o has tenido problemas con otros Kandozi o mestizos por la pesca? Por qué
¿Crée que es una actividad que la van a poder seguir haciendo siempre? Por qué
Pesca - COMERCIALIZACION
¿Vendes a buen precio? o intercambias por mercadería? O las dos cosas?
¿Te alcanza para tus necesidades?
¿Qué te gustaría mejorar, te gustaría ganar más, ahorrar más, tener para emergencias?
¿Yungani ha servido para algo en la comercialización?

Madera – REGULACIONES/GOBERNABILIDAD
¿Está sacando madera actualmente?¿Por qué?
¿Quiere seguir sacando madera en el futuro?
¿Cuánta madera corta, lo que usted quiera?
¿Alguien regula la corta de árboles?
¿Se controla algo dentro de cada familia?
¿El control es entre miembros de la comunidad y del Apu?
¿Se organiza usted con otros para sacar madera?
¿Siempre ha sido así?:
¿Está usted de acuerdo con esa forma? Por qué?
Madera – BENEFICIOS
¿Quien te enseño a sacar madera?
¿Qué significa la tala para un Kandozi? Qué tan importante es?
¿La actividad maderera era mejor antes, ahora o igual? Por qué
¿Qué beneficios te da la madera?
¿Ahora hay más beneficio que antes o igual? Por qué
¿Hay mas gente que se beneficia o son menos ahora? Por qué
¿Crée que es una actividad que la van a poder seguir haciendo siempre? Por qué
¿Tienes problemas con otros Kandozi o mestizos por la madera? Por qué
¿Se ve afectada la caza con la tala de madera?
Madera – COMERCIALIZACION
¿Vendes a buen precio? o intercambias por mercadería? O las dos cosas?
¿Lo que ganas de la madera lo usas igual que lo de la pesca, gastas en lo mismo o es para otras cosas?
¿Te alcanza para tus necesidades?
¿Cómo establece el precio de la madera?
¿Sabe cubicar? Quien cubica?
¿El estado controla algo de la tala o comercialización?

Appendix II

Inventario de Pescadores y producción de pescado (Enero 2009)

Nº	Name	Age	# Wifes	# of children			Owns Home	Community	Fishing ground	# days	Fishing gear	Fish Catch (kg)			Price per kilo	Total income from fish	Eggs catch (kg)	Price per kg of eggs	Total income from eggs	Total income	Expenses	Balance
				M	F	Total						During fishing season	During fish spawning sea.	Total								
1																						
2																						
3																						
4																						

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